McGRAW-HILL DIGEST

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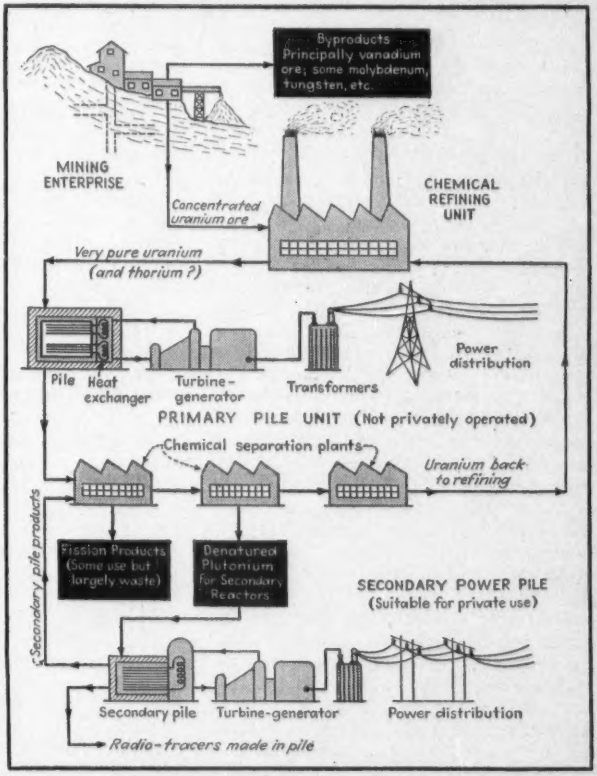
Outlook for Atomic Power

Believed to be economically feasible, industrial utilization of nuclear energy involves many major problems, early solution of which are foreseen

While atomic power is costly in terms of man-hours, the expense should decrease rapidly until large installations become economic. It appears likely that secondary plutonium reactors may produce power for 5 to 15% less than coal-fueled plants. And the large primary pile probably could sell plutonium at a price equivalent thermally to coal, and still produce power at a cost of 3-4 mills per kwh. These conclusions, and those that follow, are from a study prepared as a project of the Carnegie Endowment Committee on Atomic Energy, in cooperation with Northern California Assn. of Scientists.

The fundamental problem of an engineer in atomic energy is to put a theoretically sound and thoroughly tested process on an operable and economic basis. This will require new materials of construction and novel fabricating techniques. Materials and methods used in present piles work, but in most cases they cost too much, and in many instances are still highly inefficient. The War Department is carrying out part of this work, $2,500,000 having been authorized.

For reasons of international safety, industrial atomic power plants will probably use a high-energy reactor with denatured plutonium as the "fuel." A large (100,000-kw.) unit is envisaged to consist first of a thick shell of concrete and special insulating materials, perhaps 30-



Idealized atomic energy industry, based upon type of organization envisioned by control plan offered by the United States to the U. N. Atomic Energy Commission.

50 ft. in diameter, sunk in the ground. Inside this shell would be a "tamper" or "reflector" which might be made of beryllium or some other material which rapidly reduces neutron velocity. Next to the reflector possibly would be found a layer of chemicals selected to react with the stray neutrons from the reaction and form such radio-tracers as might be desired. In the interior, the pile itself, would be a mass of plutonium suitably protected from the heat it is expected to evolve, together with a highly purified moderator to reduce the velocity of the neutrons produced by fission, and a heat-exchange medium consisting of liquefied metal.

In transferring the heat to the steam, which would drive a turbine, the design engineer has two alternatives: (1) to pump around huge quantities of molten metal, or (2) to vaporize and condense a suitable metallic liquid.

Besides the reactor, a considerable amount of accessory equipment must be present. A small chemical plant, operated by remote control, must dissolve the "burned out" slugs of plutonium and separate the metal by chemical means from the fission products. The unreacted plutonium can then be returned to the pile. The useful fission products would be separated and the remainder disposed of. Waste disposal means were conceived as consisting of deep wells similar to natural gas wells driven to a stratum where a suitable reservoir could be eroded out. An alternative might be a pipeline to the bottom of the ocean. Other plant facilities would probably be necessary to further process the tracers that would be obtained and put them into distributable form.

The turbine would be operated by steam, or perhaps by air, heated in passing over coils containing the heat exchange fluid. In this way, it is hoped to minimize the problem of getting highly radioactive material inside the turbine, which would tend to preclude repair and maintenance work. The turbine would have considerable advantage in thermal efficiency. Since no large volume of gases is formed as a result of "combustion" in a pile, and losses due to radiation and convection are infinitesimal, no heat will go out the chimney. Therefore, an efficient plant should easily transform 40% of the heat units evolved into kilowatt-hours.

The design of a primary pile is more involved than that of the high-energy plutonium reactor. The fuel would probably be an alloy of uranium and plutonium. Its principal process would involve the fission of U-235 and plutonium and would create even more fissionable material than is destroyed. Both plutonium and power, then, are the principal marketable products obtained, and pure uranium is the only raw material required.

Primary pile units must be relatively large to be efficient because of the operating and chemical processing equipment used, as well as the waste-disposal facilities. They would generate many hundreds of thousands of kilowatts when fully operated. It is estimated that for every 8,000 kwh. produced at 40% thermal efficiency, 1 gram of plutonium could be separated. Because of the emphasis on plutonium production, there would be few stray neutrons available for making byproduct radioactive isotopes. In a 500,000-kw. primary unit, about 250 kg. (550 lb.) of plutonium probably would be produced per year. This would be denatured and sold for use in secondary piles at $20-50 per gram.

Uses for the radioactive fission products are likely to be negligible compared to the amount available.

The world has a huge reserve of "fuel" for atomic power plants. Uranium is more abundant than silver, antimony and mercury combined. While known workable deposits are scarce, the abundant granites and rhyolites contain 10-20 grams of fissionable elements per ton, 20-25% of which is uranium, the remainder thorium, also useful as atomic fuel. —CHEMICAL ENGRG.

Coal-Fired Turbines Coming

Major problems solved. Two power locomotives scheduled for on-rail tests in 1948. Credited with many advantages over diesels

Credited with a dozen advantages over the diesel engine, the coal-fired gas-turbine locomotive is moving toward practicality and should be undergoing on-the-rail tests by June 1, 1948.

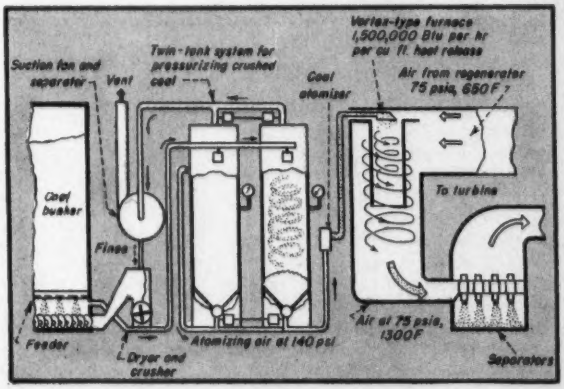
Coal-handling, pulverization, and fly-ash removal problems have been solved in the laboratory by researchers working for the Locomotive Development Committee of Bituminous Coal Research, Inc. Now efforts are concentrated on final solution of combustion problems.

Gas-turbine locomotives are expected to burn less than 1 lb. of coal per rail hp.-hr. without smoke, cinders, fly-ash or slag; cost no more than a diesel and weigh considerably less; require no water except for the train-heating boiler; need less maintenance than the steam or diesel locomotive; require only a 2-man crew, with no maintainer; involve only a negligible lubricating cost; have an availability comparable to that of the diesel. Other advantages include reduction in roundhouse time because of double-end design, coal capacity for 1,000 mi. of operation without refueling, and elimination of the tender by placing the bunker in the cab.

Shaft thermal efficiency will be between 22.0 and 23.5% compared to 4 to 8% for the average steam locomotive now in use, and a regenerator will raise the efficiency to about 25% at full load, maintain good efficiency down to ¼ load. Designs promise a locomotive weight of 17-25 lb. per shaft hp. compared to about 50 lb. for the diesel. While the thermal efficiency of the diesel is higher, the gas-turbine will burn low-cost coal so that its fuel bill will be about ⅓ that of the diesel, ⅓ to ½ that of the modern steam locomotive. The fuel handling system will use regular locomotive coal and will feed it—dried, crushed, and pulverized—up to 8,000 lb. per hr.

Because the gas turbine is considerably more compact than the diesel, up to 8,000 hp. is possible in one unit.

In addition to its railway application, the coal-fired gas turbine is expected to compete with the oil-burning diesel in isolated power stations where condensing water is costly. Its use on ships is a very definite possibility. —COAL AGE



BOOST FOR GAS TURBINE— Ability to burn coal in the open-cycle gas turbine system seems essential to its assuming wide commercial importance. So the Locomotive Development Committee of Bituminous Coal Research has proposed this coal-handling and combustion plant. The coal is crushed to 8-mesh, discharged into twin pressurizing tanks that are filled alternately, and is pulverized by air pressure drop in a jet atomizer. It burns in a cyclone furnace, and combustion products, mixed with excess air, pass through Aerotec tubes where about 95% of flyash is separated from gas. Tests indicate that the fine particles passing into the turbine do not cause blade erosion. —POWER

Streptomycin Engineering

One factory produces 100,000 grams a month of the wonder drug with modern equipment, unusual processes, and model control methods

Responsible for saving many lives during the war and proving equally vital in peace, the new wonder drug streptomycin has been engineered into commercial production. Merk & Co.'s new $3,500,000 factory is now producing more than 100,000 grams a month and is not yet up to ultimate capacity.

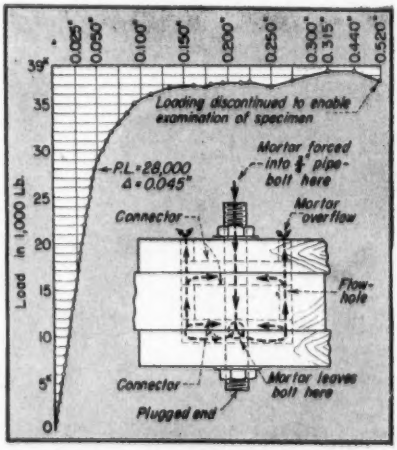
The process starts with a dilute aqueous solution containing about 1% glucose, 0.5% peptone, 0.5% meat extract, and 0.5% ordinary salt. After this mash is sterilized in the fermenters by heating to 120°C., it is cooled and inoculated with a pure culture of *Streptomyces griseus* and aerated under aseptic conditions at 25-30°C. Carbon steel fermenters of 4 sizes are used, each in the series providing the required amount of growing organism or inoculant for the next larger unit.

Fermented broth flows continuously through a pressure filter to remove mycelium, then the pH is carefully adjusted and the filtrate passes through a second filter for final polishing. After being tested for clarity with a photocell, the filtered broth is mixed with activated carbon which adsorbs the streptomycin. A pressure filter removes the carbon adsorbate cake, which is washed with alcohol to remove impurities.

Streptomycin is removed from the carbon in a 2-stage countercurrent elution process using acidified solvent such as HCl and alcohol, streptomycin hydrochloride being formed. Impuritites remain on the carbon. The acid eluate is neutralized and then concentrated and dehydrated in a series of 3 single-pass vacuum evaporators. After dehydration the concentrate contains about 25% solids, of which less than ¼ is streptomycin.

Crude streptomycin in the concentrate is then precipitated by addition of another solvent, the precipitate being retained in a plate and frame filter press and subsequently dried in a vacuum unit. Containing about 25% streptomycin, the crude is redissolved and passed through a process where complex reactions remove toxic impurities. The purified streptomycin is precipitated filtered and dried, then redissolved, passed through a biological filter, and shipped in stainless steel containers to a finishing plant.

Concentrate from the shipping containers is blended, then the pyrogens are removed in a biological filter. Metered into stainless steel trays, the material is frozen at -40°C. and placed in a high vacuum for dehydration by sublimation



CONCRETE TIMBER JOINTS—Made from plastic cement mortar forced into prepared pockets after wood members are assembled, connections have proved successful under extensive tests. Shown is load test in end-grain loading of 3 pieces of yellow pine with 14-day old, 4½-in. dia. concrete connectors. Advantages: full contact bearing on all wood areas, misalignment of pockets causes no assembly difficulty, misshaping of pockets has no harmful effects, timbers can be dismantled, reassembled. —ENGRS. NEWS-RECORD

to a pure dry cake. Ball mills reduce the dry cake to a fine powder, which is weighed into sterile vials.

To maintain sterile conditions in vital areas of the plant, incoming workers change into sterile uniforms and shoes. All air entering the building passes through sterilizing filters of the air conditioning system. As added protection, triethylene glycol is applied as a fine mist. Ultraviolet lamps are a final precaution in cubicles where streptomycin is exposed. —CHEMICAL ENGRG.

CURBING YELLOW RIVER

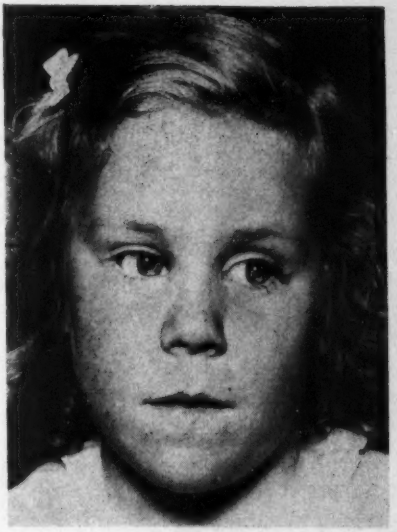
To close a mile-wide gap in dykes on the Yellow River in China, engineers have built embankments of earth, rice stalks, and willow branches out from both sides, have driven 500 Douglas fir piles to depths of 30 ft. at embankment ends and supported a trestle on the piles. Wire-mesh flood mats were laid between piles, and covered with rock fill. The fill will be covered with burlap and earth. Cost of project, which will divert Yellow River back to its pre-1938 course, will be about $15 million. —ENGRG. NEWS-RECORD

TALKING LETTERS

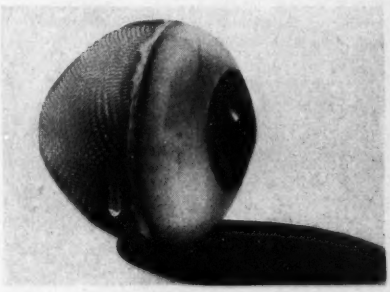
Reproduction of the human voice on paper disks, coated with an iron-oxide film, now makes vocal correspondence possible through magnetic recording and reproduction. Disks may be reused after magnetically erasing the 3-min. conversation. Recording and reproduction are done by identical 13-lb. reproducing-recording machines. The coated paper disks are folded for mailing. —BUSINESS WEEK

BOMB SEEKS TARGET

Tests by U. S. Navy of the Bat, radar-guided bomb, indicate that it may replace orthodox bombs as weapons against shipping, bridges, and isolated structures in future wars. With a top speed of 320 mph., it carries a 1,000-lb. bomb load, is highly accurate at 5,000-ft. altitude 4 miles from target. Bat's nose radar is piped to mother ship's set, used to pick up target. After locking radar, the bomb is released and will follow target through any evasive action. An off-center reflector picks up returning waves, indicating lateral deviation from course, and passes impulses through gyro-pilot to servo unit in tail which controls flight. Bomb can be affixed to current fighter planes. —AVIATION NEWS



"GLASS" EYE THAT MOVES—A little girl who lost her right eye demonstrates how she can move her new plastic replacement in coincidence with her left eye. Tantalum mesh covers the back of the artificial eye and this is sewn to the eye muscles with tantalum threads. More than 200 have been fitted with it. —BUSINESS WEEK



ELASTIC COTTON FABRIC—Suitable for such applications as wearing apparel, surgical dressings, slip covers, and gloves, Sterx is made elastic by twisting yarn on an up-twister, using special coiling device. Regulated twisting permits varying degrees of elongation. Weaving is by normal methods; washing or dry cleaning does not reduce elasticity. —TEXTILE WORLD

TALKING LAMP

Caesium vapor, an efficient generator of infrared radiations but a poor visible illuminant, is used in a Westinghouse lamp to permit secret 2-way conversation over an invisible searchlight beam. Words are transmitted instantaneously at conversational speed, and there can be no eavesdropping or jamming of the "beam-casting" since message is restricted to listeners within beamspread. Unaffected by static and all weather except very heavy fog, the system should be useful in confidential ship-to-shore or plane-to-plane communications and in disaster areas where radio broadcasting is impossible —AIR TRANSPORT

SELF-SERVICE TICKETS AND GASOLINE

Pennsylvania Railroad has installed an automatic ticket vending machine which takes the customer's coins, issues a dated ticket, and makes the correct change, in 2 sec. It lists 16 stations, could handle 50. Made by Trans-Meter Corp., it is still experimental. Expected price is $1,000.

Gasoteria, Inc., has arranged for the manufacture of coin-operated self-service gasoline pumps to aid drivers when service stations are closed or attendants are busy. Deposit of coins sets up a credit and turns on a switch, enabling the customer to operate the pump. When indicated amount of fuel has been drawn, the pump shuts off. If tank won't take full amount of gasoline for which money was deposited, change is returned in 5¢ increments. —BUSINESS WEEK

PROTECTS METAL AGAINST CORROSION

Corrosion-resistant nickel-zinc or nickel-tin coatings can be applied to sheet, tube, mesh, diced, and perforated materials, as well as many other parts, however intricate or irregular, by Corronizing. Nickel-zinc is used where heat, moisture, sulphur dioxide, sulphur trioxide, and other gases combine to form severe corrosive conditions, where salt spray and chemical fumes exist, and where brines and other chemical solutions are handled. Automobile exhaust mufflers, fuel tanks, coal stoker parts, coal-, gas-, and oil-burner parts, flues, breechings, chemical hoods, spray booths, filters, coolers, chemical condensers, and fume washers are representative articles that have been protected against corrosion by this coating. Nickel-tin is suitable for food containers and food handling and processing equipment, as well as for parts requiring a decorative finish.

The nickel-zinc coating is slate grey, can be painted, and the nickel-tin has the conventional matte finish of tinplate.

Three operations are involved in Cor-

ronizing. The base metal—steel, bronze, brass, or other metal — is electroplated with nickel. Then zinc or tin is electroplated directly over the nickel. Next, the part is heated to 700° F. for nickel-zinc or 350° F. for nickel-tin to diffuse the platings and alloy them more or less into layers. The layer next to the base metal is nickel; the surface layer is nickel-zinc alloy or free tin, depending on the type of Corronizing; and the intermediate layers are alloy phases of the two plating materials. This composite coating offers dual protection and better corrosion resistance than nickel or zinc or tin alone. —PRODUCT ENGRG.

ELECTRONIC BRAZING CUTS KITCHEN-TOOL COSTS

Speedy production-line brazing of stainless steel kitchen cutlery is accomplished at Adel Precision Products Corp. with a 20-kw., 450-kc. radio-frequency generator. A ferrule is fastened on a shank in 15 sec., the shank on the blade in 12 sec. Investment in equipment amounts to $10,000; operating costs an hour are $10 for labor and 80¢ for the h-f generator. The latter includes power at 1¢ per kwh., tube replacements, and amortization. Total saving over hand soldering is placed at $228 a day, which will write off the investment in 2 months. —WELDING ENGR.

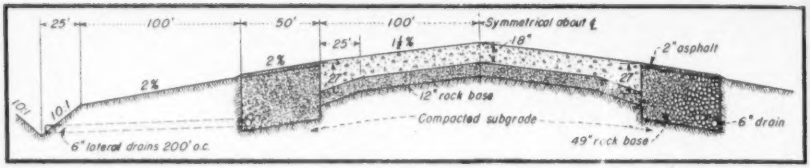
BUILDS BETTER HIGHWAYS

Nebraska State Highway Department has constructed armor-coated, bituminous-sand pavement superior in riding quality, with longer life, and requiring less initial cost and maintenance, than conventional gravel-type roads with clay binders. At roughly $19,000 per mile, the road has surfacing of 5-in. bituminous sand. Blow-sand subgrade is compacted by rubber-tired earthmoving equipment. Materials used are sand with mineral filler added and a cutback asphalt binder. Finishing is with light penetrating seal coat with layer of pea gravel. —ENGRG. NEWS RECORD

BACTERIAL WARFARE

Clostridium botulinum is a new, mass-killing poison which, if injected into food and water supplies of a nation, would cause mass death of millions, says the Special Projects Division, U. S. Chemical Warfare Service. So powerful that 1 oz. could kill all the residents of the U. S. and Canada, the poison is a pure form of the toxin causing botulism. There are no stockpiles, no manufacturng facilities, yet production could be done in any modern brewery. Application of the poison is the big problem, spraying from airplanes being the probable solution. —SCIENCE ILLUSTRATED

BURNS HOLES IN ORE—For preparation of blast holes in hard, low-grade iron ores, a 6-in. x 30-ft. hole is driven by rapid melting of the ore by fuel containing suitable fluxing media and high purity oxygen. Laboratory tests indicate this method of cutting blast holes is far faster than others. —ENGRG. & MINING JOURNAL



NO EXPANSION JOINTS—Built in eight 25-ft. strips, this 200-ft. wide airstrip is the first heavy-duty concrete runway with no expansion joints. It has contraction joints at 12½-ft. intervals to control shrinkage cracks. Dowels on 18-in. centers provide shear transfers between the continuous concrete strips. —ENGR. NEWS-RECORD

TWO-WAY RADIO AIDS POWER LINE CREWS

West Penn Power Co. has solved the problem of quick, reliable communications between central stations and service trucks when trouble develops. Fourteen trucks have been equipped with 35-watt, frequency-modulated, 37.18-mc. transmitters, and a fixed 250-watt station is in regular operation at the principal substation. Reliable reception is obtained over a 30-mile radius in all kinds of weather. —ELECTRONICS

AUTOMATIC GAS MACHINES HEAT-TREAT EFFICIENTLY

Heat treatment of metal parts in automatic gas-fired machines provides close temperature control, speeds production, saves floor space, produces less scaling. To take specific applications: The top ¼ in. of a 1-in. steel bar is flame-hardened at the rate of 1 piece every 55 sec. Stainless steel tubing of $\frac{1}{16}$-in. wall thickness is annealed in 12 sec. Chisels are hardened and tempered at rate of 60 an hour. Automobile gears are heated for hardening in 22 sec. Automatic gas heating has been successfully applied to parts as heavy as 56 lb., as light as a few ounces.

High-temperature, internal-combustion nozzles will deliver a 3100° F. flame at 1,000 fps. theoretical velocity. Of different shapes, these nozzles properly apply heat to the workpiece contour. And high heat transfer rates are obtained for selective or localized heating because the combustion chamber can release up to 40,000,000 Btu. per hr. per cu. ft. of combustion space. Radiant-type nozzles produce a uniform incandescent radiating surface to maintain temperatures of 1300 to 3100° F. Heat penetration rates of 1-in. thickness in 2 to 4 min. are achieved, contrasted with the rule-of-thumb 1 in. per hour for customary furnace practice.

Horizontal and vertical drum-type machines, with automatic indexing and controls, and straight-line conveyor units make gas-flame heat treating a precise operation requiring little labor and fitting efficiently into the factory production line. —AMERICAN MACHINIST

IRON MINING INNOVATIONS

In beneficiation, the cone in sink-and-float practice is replaced by a modified spiral classifier, the separation is in the tank . . . Exploitation in diamond drilling to increase core recovery by design and drilling technique continues with a rising tendency to wedge off new holes from intermediate points on the hole first drilled . . . Walking draglines of 25-cu. yd. capacity for stripping are in use, with a trend toward trucks with 35-40-ton capacity. —ENGRG. & MINING JOURNAL

WHIPPING SOYA CREAM

"Whip Topping," a soybean substitute for whipping cream, is being produced at the rate of a million half-pints per month. Retailed at 26¢ a half-pint, about 7¢ less than regular whipping cream, the frozen cream is a compound of soya protein, vegetable fat, carbohydrates, salt, flavoring and coloring. This new food product is distributed in 30 states through 200 outlets. —BUSINESS WEEK

Multiple Management Works

McCormick & Co. finds junior management boards good source of future executives and a means of increasing profits and improving labor relations

Multiple-management boards, tools to better production, are now being employed in 500 plants throughout the United States. Pioneered by McCormick & Co., programs may be employed in management, distribution, sales, and production fields, on small department, division, section, factory, or line scales. Basic principle behind programs is the development of thoroughly trained and experienced junior executives with increased knowledge of their department, related departments, and the company.

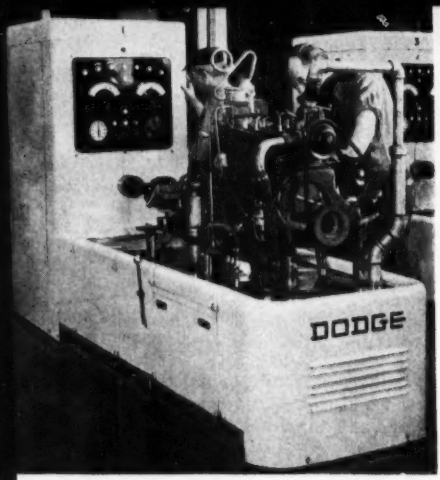
McCormick, which adopted its program in 1932, has found 3 definite benefits: It serves as an excellent training school for future top management, provides a source of new ideas resulting in greater profits, and provides the basis for greater cooperation between management and labor. Junior board members, elected by popular vote and limited to four 6-month terms, study problems of office personnel, office efficiency, new products, advertising, sales campaigns, surveys, and public relations. A merit rating is used to score members.

Top management officials do not sit with the junior boards, and all recommendations must be unanimously passed. The junior board can only recommend, it does not act directly. Members are paid for their services either through additional dividends or by directors' fees.

Factory executive boards, composed of foremen, setup men, supervisors, and junior executives, and designed to bolster foreman's position, have proved even more successful than junior executive boards in many cases. Dealing with problems of production, schedules, new machinery, motion and time study, shipping problems, warehouse policies, order filling, stock records and handling, safety and first aid, and training, results of board action can more easily be checked in terms of profit. Factory boards have streamlined production through suggestions, developed prestige for foremen and supervisors, and raised human relations to a new, unprecedented levels.

Failures in multiple-management programs, rare indeed; usually arise from 1 or 2 causes: management, after setting up programs, has failed to develop the plan or it fails to give the board necessary freedom of action. The board's success lies in 2 principles: top management must be completely sold on the idea and be willing to guide and encourage young executives, and it must be willing to give the junior board complete freedom of action and access to company books, policy, and data. —FACTORY

FOR CONTOUR PLOWING—With wheels that adjust to land slopes by gear arrangement, this biased, spill-proof tractor developed by L. C. Burton is the possible answer to the farmer's problem of hillside fields. —BUSINESS WEEK



ROBOT TESTS ENGINES—This electronic test stand determines whether the Dodge engine, clutch, fluid coupling, and transmission meet performance standards. If there is a defective condition, a red light flashes, then a roving inspector analyzes the trouble, makes adjustments or orders repairs. Operator is required only to load and unload and he can operate 3 stands. Engine is coupled to a generator for load testing. Ignition is connected to lights to check timing and to electronic indicator to show speed. Testing cycle is automatic. This tester eliminates the human element—no necessary test or adjustment can be overlooked before the power plant is installed in the automobile. —AMERICAN MACHINIST

INTRIGUING NOVELTIES

Aluminum-cored magnets will reduce work of women in removing hairpins. . . . A lighter-shaped perfume atomizer is now available. Leakproof and evaporation-proof, it holds a week's supply. . . . For lighting pipes, a slight shake ejects a lighted cartridge, with protected flame, from a new lighter. . . . A 20-in. extension to standard telephone receivers will allow your secretary to take notes on conversations or permit double receivers for people hard of hearing or in noisy offices. . . . With a new pipe coupling held together by a quick-locking wedge key, only a hammer is required to make plumbing repairs. . . . A system of springs and overlapping corners fits a new adjustable plastic frame to pictures which are of different sizes. —SCIENCE ILLUSTRATED

ASPHALT UNDERSEAL FIXES PAVEMENT

Extensive use of hot asphalt underseal on Texas highways has shown its value in filling subgrade cavities, raising settled slabs and stopping subgrade pumping through joints and cracks. A 1-in. tapered nozzle is hammered into holes drilled through pavement, and 2 metallic hose lines connect nozzle to pressure distributor. A 3-way valve unit permits asphalt at 450° F. to be circulated through hose to tank when nozzle is not injecting. Asphalt used is 30-penetration, melting point 185°, and pumping pressure is 35 psi. —ENGRG. NEWS-RECORD

WHAT'S NEW IN AIRCRAFT

Designed to sell at the low price of $5,000, the 185-190-hp., 4-place, all-metal plane of the Weatherly-Campbell Aircraft Co. will land at 52 mph., cruise at 140 mph. at 8,000 ft., range 750 miles . . . Equipped with fixed leading-edge wing slots as well as slotted ailerons and flaps, the 100-hp., 2-place, KZ-3 of Skandinavisk Aero Industri, Denmark, lands at only 36 mph., cruises at 106 mph., takes off in 230 ft., lands in 165 ft. . . . The new $115,000, 8-10 place Grumman *Mallard* amphibian cruises at 180 mph. and has a luxurious passenger cabin with complete upholstering, carpeting, soundproofing, thermostatically controlled heating and ventilating system, and individually controlled fresh-air ducts. Forward compartment has 2 full-length divans with center sections removable for installation of card tables. Aft compartment contains 4 reclining chairs. Powered by two 600-hp. radial engines, the *Mallard* has a 1,000+-mile range, 10,000-ft. ceiling, good single-engine performance, and a hull designed for exceptional seaworthiness. —AVIATION NEWS

Developed from the B-29, Boeing's long-range 67½-ton *Stratofreighter* will have a usable volume of 6,140 cu. ft. (twice that of a railroad car), will carrry

a 41,000-lb. payload at 300-350 mph., and is expected to operate at 3¢ per mile direct cost. The ship will have 4 separately accessible cargo compartments and be fitted with pressurization, refrigeration, and heating systems. —AVIATION

STEAM GENERATOR DESIGNED TO END FEEDWATER TROUBLE

Some of the feedwater troubles in high-pressure steam generating equipment may be solved by the proposed Benson steam producer, based on the European Benson boiler. Operation of high-pressure steam plants with any ratio of makeup up to 100%, with most waters, even sea water or blowdown water from other steam units, is claimed to be entirely feasible.

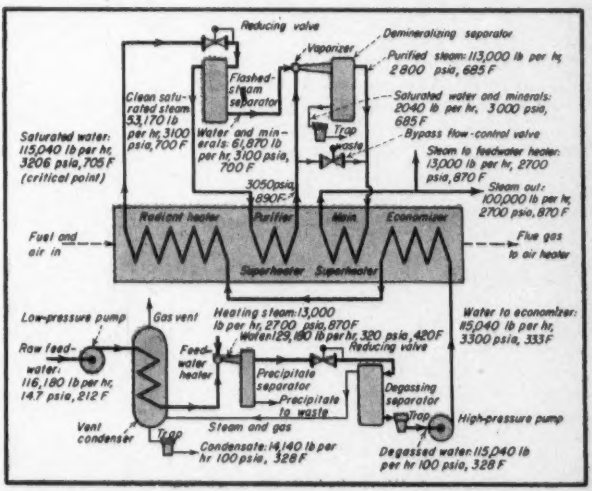
In this steam producer, all steam formation takes place remote from heat-transfer surfaces, aiding in control of scale deposition. Basically, it comprises 3 groups of equipment: (1) degassing unit, (2) heating surfaces, and (3) demineralizing system. Flow-circuit details are shown in the diagram, the flow balance being calculated for a net production of 100,000 lb. per hr. of steam at 2,700 psia. and 870° F. Superheated steam and water are brought together in the vaporizer to vaporize all but 2,040 lb. per hr. of the water. The minerals concentrate in the remaining water, forming a sludge, which is removed from the circuit in a demineralizing separator and trapped to waste. Tests have proved the performance of the degassing and demineralizing process.—POWER

PERMANENT MOLDS IMPROVE ALUMINUM ALLOY PARTS

Demand for aluminum-alloy castings made in permanent molds is growing rapidly. Essentially a quantity production process, permanent-mold casting is competitive in cost with sand casting for more than 500 parts. Production is faster, and low-priced operating labor can be used. In comparison with die casting, the mold costs are materially less than die costs.

Permanent-mold castings have better mechanical properties because of fine grain size, soundness, and excellent physical properties. They have greater strength and hardness, higher elongation, and greater resistance to impact, alternating fatigue stress, and corrosion than sand castings of the same alloy. Permanent-mold castings machine well, with less scrap. The fine grain also improves polishing and finishing qualities of the castings. —PRODUCT ENGRG.

Flow-circuit details of the Benson steam producer which offers intriguing prospect of solving steam generator feedwater troubles.


Reducing valve
Vaporizer
Demineralizing separator
Purified steam: 113,000 lb per hr, 2800 psia, 685 F
Flashed-steam separator
Clean saturated steam 53,170 lb per hr, 3100 psia, 700 F
Saturated water and minerals: 2040 lb per hr, 3000 psia, 685 F
Trap
Bypass flow-control valve
Saturated water: 115,040 lb per hr, 3206 psia, 705 F (critical point)
Water and minerals: 61,870 lb per hr, 3100 psia, 700 F
waste
Steam to feedwater heater: 13,000 lb per hr, 2700 psia, 870 F
3050psia, 890F
Steam out: 100,000 lb per hr, 2700 psia, 870 F
Radiant heater
Purifier
Main
Economizer
Fuel and air in
Flue gas to air heater
Superheater
Superheater
Low-pressure pump
Gas vent
Heating steam: 13,000 lb per hr, 2700 psia, 870F
Water to economizer: 115,040 lb per hr, 3300 psia, 333F
Raw feed-water: 116,180 lb per hr, 14.7 psia, 212 F
Feed-water heater
Water 129,180 lb per hr, 320 psia, 420F
Reducing valve
Precipitate separator
Precipitate to waste
Degassing separator
Vent condenser
Trap
Steam and gas
Condensate: 14,140 lb per hr 100 psia, 328 F
Trap
High-pressure pump
Degassed water: 115,040 lb per hr 100 psia, 328 F

New Materials for Builders

Construction economies and design changes may be effected by lightweight concrete, unique wall and floor panels, and other innovations

Developed to meet a shortage, several new materials now under study by National Housing Agency appear to have a promising future in the building industry.

Lightweight Concretes—Structural concretes weighing only about 50 lb. per cu. ft. (conventional lightweight concrete weighs 90 to 100 lb.) will stimulate the demand for precast units. One major type uses light inorganic aggregates; another, farm and forest wastes; a third contains an admixture to expand the mix and produce foamed concrete. One of the important light aggregates is perlite.

Lightweight fire-resistant structural concretes that can be nailed and sawed are being made with wood and vegetable fibers comprising 75-90% of the bulk. A mix of straw and wood fiber and portland cement weighs 30-50 lb., has a compressive strength of 500 psi. for the lighter types to 2,300 psi. for the heavier, with tensile strengths of 175 to 500 psi. Wood fiber, emulsified asphalt, and portland cement yield a 50-lb.-per-cu.-ft. material with a compressive strength of 1,500 psi.

Wallboards from Waste—Straw is fiberized and made into ½- to ¾-in. thick board by felting, and it is believed that 4 plies with ¼-in. opposite facings of compressed strawboard would be suitable as exterior wall paneling. Other boards utilize waste wood bonded with synthetic resins, or corncobs bonded with phenolic resin.

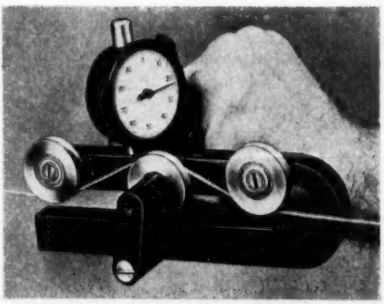
New Floorings—A new flooring consists of 3 plies of veneer from noncommercial logs, the ¼-in. plies being bonded with a resinous plastic and assembled in 12-in. wide sections up to 20 ft. in length. A wearing surface of select hardwood is provided, and the under surface is treated to prevent water absorption.

Another substitute flooring material under consideration consists of a patented fire-resistant mixture of macerated wood fibers and cementitious substances. The ingredients are mixed with water, troweled into place, cured for at least 5 days and finished by sanding, waxing, shellacing, or varnishing.

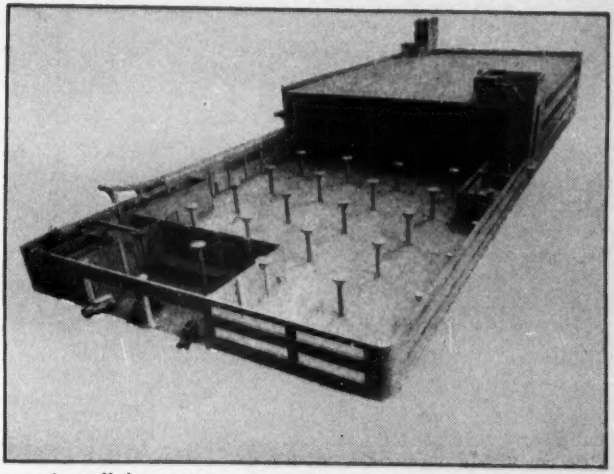
Walls and Roofing—Materials for walls and roofs are two types: (1) treated plywood and (2) structural panels made from substitutes for lumber and plywood. Plastic or sheet metal reinforcing reduces the amount of plywood required and increases the strength and rigidity of the facing.

In the second of the two classes of wall and roof materials are various types of concrete panels. One consists of two 1-in. thick, wire-mesh reinforced concrete sheets held about 2 in. apart by perforated metal channels.

Considerable enthusiasm is being expressed over the possibility of lightweight structural plastic cores. Experimental houses have been built using 0.02-in. aluminum sheets as facings, with an



SINGLE-THREAD TENSOMETER—Threaded with moving yarn or cord, this Walter Kidde & Co. meter measures tension up to 100 lb. directly in pounds. Grooved wheels are of stainless steel on precision ball bearings; handle and frame are of aluminum alloy with black anodic coat. Rapid fluctuations are recorded. —TEXTILE WORLD



SECTIONALIZED PLANT MODEL—To facilitate study of production possibilities of floor space and production line layout, this wooden ¼-in. to 1-ft. scale model reproduces every feature of Philco's proposed radio plant. Negligible in cost, it has been of tremendous value. Picture shows first floor section, half of the other floors removed. —FACTORY

inserted vapor barrier and a cellular core of kraft paper impregnated with thermo-setting phenolic resin.

Other Innovations—One type of window under study has an aluminum frame and sash, no mullions. Double hung, it has metal-band springs in the jamb to permit removal of the sash and to hold the sash in position without the aid of balances. Also under consideration is a 3-piece knock-down steel door frame made of 5-in., 18-ga. metal and easily assembled on the site.

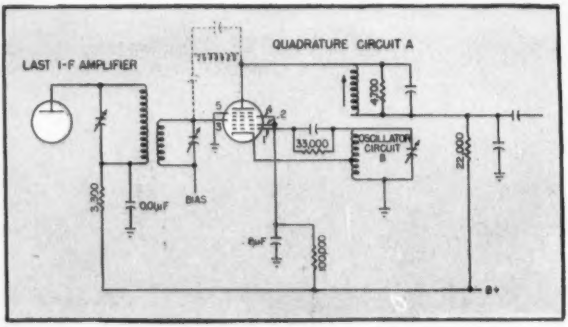
Developed to simplify the problem of wiring prefabricated houses, a 2-piece wall base and conduit is made of 18 ga. steel. One piece is fixed to floor, other is detachable. —ENGRG. NEWS-RECORD

WOOD TREATING

To lessen absorption and retention of moisture by wood, the U. S. Dept. of Agriculture states that vaporization of the wood with pyridine and acetic anhydride solution will reduce the tendency of swell or shrink further by 70%. Solution toughens wood, reduces decay, and may increase strength. Gluability and paintability of treated wood is being studied. —BUSINESS WEEK

NEW FOR THE HOME

Using an electronic ionization tube to develop ozone, a 7x6x5-in. device of Refresh-Aire Ozonizer Corp. rids room of cooking, tobacco, and other odors. It consumes 10 watts, does not interfere with radio. . . . To warm food, Amidex offers a phenolic plastic container into which a glass or aluminum cup is set. Unit is 175 watt, ac. or dc., has 3-heat switch and thermostat control. . . . A beam of light can be sent into otherwise inaccessible places by a waterproof flashlight with bulb on flexible extension, produced by Aero-Motive Mfg. Co. Made of polished aluminum, it uses standard AA batteries. . . . Fingertouch control releases DDT or Pyrethrum in atomized form from a "bug bomb" of Westinghouse Electric Corp. One bomb contains enough solution to spray flies, moths, mosquitoes, ants and other insects in 150 normal size rooms. . . . Giving full-toned reception for individual listener without disturbing others nearby, an under-pillow speaker offered by The Brush Development Co. causes no lump under head, consumes 0.0025 watt, is used with any radio. —ELECTRICAL MERCHANDISING



BOOST FOR F-M—Seen as furthering f-m radio development is a Philco single-stage f-m detector highly responsive to carrier frequency deviation but not at all to carrier-amplitude variations. Essential parts are a heptode tube and 2 tuned circuits reactively coupled. Output of i-f amplifier is applied to control grid 3 of heptode, and audio is derived from the plate current. One of the tuned circuits is connected to the first grid of the heptode, the other to the plate. Both are tuned approximately to intermediary frequency, and plate tuned circuit is damped. Neutralizing circuit (dotted) can be used. —ELECTRONICS

HIGHWAY TO TRANSFORM BOLIVIA'S ECONOMY

To connect the agriculture, oil-producing, and mining regions of Bolivia and unite that country economically, a 305-mile highway with 2-in. bituminous top surfacing, is being constructed to join the town of Santa Cruz and Cochabamba. Long-haul distances, lack of local building materials, and shortage of construction equipment place heavy burdens on the engineers. —ENGRG. NEWS-RECORD

POWDER BEARINGS

Using a series of sharp hammer blows approximating a pressure of 8 tons per sq. in., powdered metal is formed into a homogeneous cohesive mass of mechanically bonded particles. Simple, inexpensive bearings are formed in this way by National Diamond Hone & Wheel Co. for a wheel dresser. Oil impregnation gives hydraulic cushioning to prevent chatter marks. Bearings have been made from copper-nickel-lead alloys, copper-tin, and pure copper. —PRODUCT ENGRG.

NEW COCKPIT PROTECTION

New designs for cockpit protection of the pilot in event of crash will include: torso semi-harness, to prevent head contact with forward structure; elimination from the instrument panel of knobs, switches and handles; use of "metallic cushion" instrument panels to lessen head injuries; pivoting arrangement on the backrests of the front seat of tandems; and increased distance between nose and cockpit. —AVIATION NEWS

ALCOHOL FROM WOOD PULP

Now producing between 6,500 and 7,000 gal. of industrial alcohol from previously discarded sulphite liquor, a West Coast plant's estimated cost of production lies between 15-19¢ a gal., compared with 10¢ a gal. for petroleum alcohol and 16¢ a gal. for molasses alcohol. Product is marketed by an industrial alcohol firm. Since present distribution requires transportation halfway across the continent, the company is stimulating the construction of related plants nearer the source. Sweden, in 34 such plants, produced 15 million gal. of 190-proof alcohol during 1945. —BUSINESS WEEK

SAFER BUS BODY

Light in weight yet high in structural strength, the Flxible Model 37-DC bus has rectangular tubes or formed channels for stress members. Outer paneling is aluminum alloy with extruded, fluted, decorative strip adding to structural strength. Heat-treated, extruded aluminum bumper exceeds tensile strength of steel often used in bumpers, giving added spring through lower modulus of elasticity. Retractable steps allow bumper to continue without joints to side of body. —BUS TRANSPORTATION

Better Textile Machines

Important improvements made by redesign to speed production, raise quality, lower cost. Electronic applications made

To reduce labor costs and improve quality and quantity of output, the U. S. textile industry has turned to more mechanization and new design.

Improved efficiency is being obtained in textile mills through mechanized materials handling between departments and the development of continuous processing machines. DuPont has developed a continuous machine for bleaching, 2 for dyeing. General Dyestuff Corp. has produced an important multipurpose device that can be used for scouring, dyeing, bleaching, and applying special finishes to textiles.

Uxbridge Worsted Co. is building a "pin-drafting" machine to improve the manufacture of worsted yarn. Cramerton Mills has designed a cotton-combing machine for making yarn without spinning.

Monarch Mills has designed a device for assisting "doffers" in removing bobbins from spinning machines.

A postwar machine of Barber-Colman Co. operates from punched cards to perform threading-up operations for looms, heretofore considered too complicated for anything except hand operation. Another, as yet unannounced, automatic filling-winding machine winds yarns at a higher speed than can be achieved by conventional equipment.

Electronics is being applied to textiles by Radio Corp. of America and General Electric Co. for high-frequency drying and treating of textiles and in cloth-straightening devices. Electrostatic alignment of fibers already has been achieved for block printing to give a suede effect (an outgrowth of the principle used to make coated abrasives).

In knitting full-fashioned hosiery, old 42- and 45-gage machines must give way to 51-gage or finer to meet present demands. A relatively new factor in women's hosiery is seamless nylons knit on 400-needle Scott & Williams circular machines. —BUSINESS WEEK

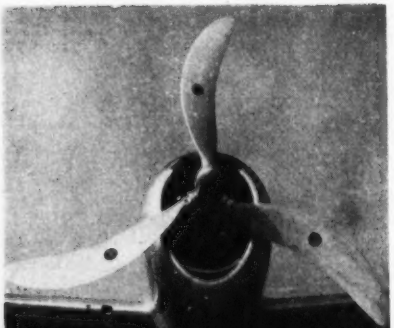
FAST FISH FILLETING

Developed by Atlantic Coast Fisheries Co., a 21x6x6-ft. machine requiring 1 operator fillets haddock at rate of 45 per min. Fish, with heads removed, are brought back down, tail forward, into center alignment by grippers over a conveyor. High-speed circular cutters groove out the dorsal fin, then stationary plow knives with flared points make parallel cuts along dorsal side. Paired traction disks, tail cutters, and belly-cutting knives leave the 2 fillets adhearing by a band of flesh to skeleton. Diverging ribbing knives sever these attachments, and fillets fall to conveyor belts.

The average man-hour output is 509 lb. Since machine does not cut odd species nor skin fish, plant labor balance will not be disturbed. Fillet output increases 15 to 18%. Knife sharpening, guide alignments are only maintenance, so "downtime" is less than 2%. —FOOD INDUSTRIES

DESK OF TOMORROW—Designed for every need, this desk includes a built-in radio, electric shaver, and dictating machine. Six conferees may sit at the perimeter of the burn-proof top. The desk is adjustable to height and is mounted on skids instead of legs. —BUSINESS WEEK

TECHNICAL SHORTS



WHIRLING SCIMITAR—In an attempt to push speeds into the transonic range (700 mph.) Curtiss-Wright Corp. has developed this swept-back propeller for AAF. Advantage is that the entire leading edge is not subjected to the effects of compressibility at same time. —AVIATION NEWS

Concrete Pumped—In the construction of a 3-story department store, 15,000 cu. yd. of cement is being moved by a single-cylinder pump through an 8-in. pipeline over horizontal distances of 475 ft. and vertical distances of 40 ft. A crew of 13 can place 406 cu. yd. during a 10-hr. shift at the third-floor level. —ENGRG. NEWS-RECORD

Finds Metal in Flesh—A supplement to X-ray examination, a fountain-pen-size electronic probe locates metal particules embedded in the flesh of patients. Increasing pitch of the tone generated indicates approach to the particle's position. —ELECTRONICS

Speeds Car-wheel Boring—Railway car wheels are bored at a rate of 43 an hour by a machine which feeds a rotating carbide-tipped combination drilling and boring tool into the hub, roughing and finishing the hole in one operation. Pullman-Standard Car Mfg. Co. developed the method to replace the conventional practice of rotating the wheel under a drill, with production of 3 to 3½ wheels an hour. —BUSINESS WEEK

Steam Saves Motor Fuel—Developed by two Swedish motor technicians, an automobile exhaust-pipe boiler supplies steam to the intake manifold where it mixes with fuel to produce a degree of humidity that reduces fuel consumption. —PRODUCT ENGRG.

Miniature Infrared Detector—Now released from secrecy, the Metascope pocket-size detector contains shielded radioactive material the energy of which makes a viewing screen sensitive to infrared. The screen glows but does not identify objects. —ELECTRONICS

Stone Hauled by Scrapers—Conventional 17-cu.yd. earth-moving scrapers are hauling 75% of the 70% limestone excavation on a highway project in Kentucky. Rock cuts are drilled 18 ft. deep, and a concentration of blast (140 holes 5 ft. apart, twelve ½-lb. sticks of 40% dynamite per hole) reduces the stone to size for a carrying scraper or 1¾-cu. yd. power shovel. —ENGRG. NEWS-RECORD

Music for Miners—Music will be dispensed by loudspeakers at the top and bottom of the mine shaft, and in the miner's dressing room, of Pennsylvania Coal Co. —COAL AGE

Quick Trip for Tank—Anchor-bolts of a 120-ft., high water tank were cut on Friday, and by Monday the 35-ton, 75,000-gal. structure was in operation at a new location 237 ft. away. During the trip, made on steel pin rollers on a double line of rails, and including two 90° turns, the tower was kept upright by cable guys; legs were kept in alignment by timber struts. —CONSTRUCTION METHODS

Jungle Apparel—Oil explorers will find the Doron jacket of plastic resin, laminated with fabricated glass, comfortable in tropic countries. Weight is 7½ lb. Protection from native arrows is afforded by a reinforced tail-piece of jacket. —BUSINESS WEEK

Fan Boosts Air-engine Cooling—A special turbine-type annular ring fan in the forward section of the engine cowl helps to cool the giant P & W Wasp Major engines in the new Republic XF-12 Rainbow photo plane to step up performance. —AVIATION NEWS

Tunneling Under Traffic—Hand-tunneled construction of a shallow 4-ft. dia., 1,000-ft. long sewer avoided interference with heavy traffic near a Connecticut railroad station. Reinforced concrete pipe encased in concrete inside pressed-steel tunnel-liner plates helped to speed the installation, which passed under a 4-track viaduct. —ENGRG. NEWS-RECORD

Metallizing Rescues Turbine—Badly eroded by steam in 23 years of service, a power-house steam turbine housing was salvaged by metallizing. A coating of 18-8 stainless steel 0.025 in. thick was sprayed on by a gun held in a jig to keep it equidistant from the housing. —WELDING ENGR.

Safe Trailing Cable—To reduce dangers inherent in trailing cables, Independent Coal & Coke Co. has designed a new cable with fine copper-wire ground shield around positive conductor, which will trip breaker, before leakage through injured insulation starts to the negative return conductor, cutting power before short occurs. —COAL AGE

Jute Finds New Uses—Improved spinning, weaving, and finishing have made jute fabrics suitable for a variety of purposes for which higher-priced textiles were used. Jute interlinings for popular-price suitings have almost ousted linen in Britain. Jute goes into a variety of house-furnishing fabrics in attractive weaves and colors. —TEXTILE WORLD

Continuous Concreting—Slip forms of 1x4-in. tongue and groove flooring are raised vertically 10 ft. per day by screw jacks to permit continuous concreting of sixteen 24-ft. dia., 125-ft. high, 7-ft. thick storage bins for soya beans in Iowa. —ENGRG. NEWS-RECORD

Ribbed Reinforcing—Using 25% less tie wire and tying time, the new Inland Steel Co. reinforcing steel bar is rolled with reverse-helical shaped cross ribs joined to 2 longitudinal ribs. Only a single tie is needed. On slab and beam sections, ties are not needed at every joint. —CONSTRUCTION METHODS

Low Cost Water Heater—Developed by U. S. Bureau of Mines, a new water heater operates at less than $1 per month on subbituminous coal. A coal hopper and constant-volume fan, a feed screw, retort, and double tank operated by thermal controls make up the system. The small flame is regulated by air-adjusting vane. —COAL AGE

Flock Printing with Powder—Spraytex, Ltd., has developed a process for flash printing in which powdered fibers are sprayed onto adhesive pattern. —TEXTILE WORLD

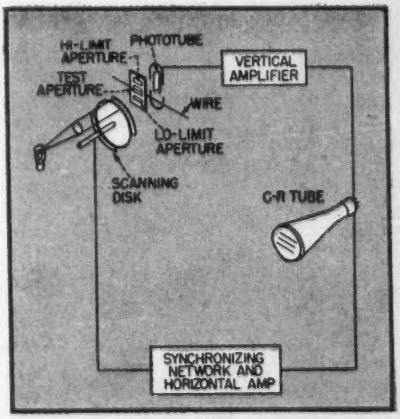
Alum'num Bridge Span — Shop-fabricated complete and set as a unit, a 100-ft. span deck plate girder for a bridge at Massena, N. Y., is made entirely of aluminum alloy, including cold-driven rivets. The span weighs 53,000 lb.; identical steel span in same bridge weighs 128,000. lb. —ENGRG. NEWS-RECORD

Moveable Steel Forms—Of steel frame mounting with sliding, hinged lever for locking, a steel form has been used to construct hollow-wall concrete houses. A 3-man crew can lay 200 sq. ft. of wall in an 8-hr. shift. Wall is 10½-in. thick, including a 2½-in. air space between 4-in. walls. —CONSTRUCTION METHODS

Spray-on Glass-metal Seal—Large and complex glass-to-metal seals are made at Westinghouse Lamp Division by spraying liquid-suspended powdered glass on hot Kovar metal, heating to fuse the glass into a film and then sealing a glass tube to the film in conventional manner. —ELECTRONICS

Powder Puts Out Fires—Developed for lint fires in textile mills, an extinguisher, which discharges a special dry powder in carbon dioxide is being adopted by many U. S. mills. The powder forms a fire-retarding coating on material, and heat liberates inert gases. Not effective against deep-seated fires, the powder has no abrasive or corrosive effect on metal parts. —TEXTILE WORLD

Safe Plane Refueling—Elimination of airport gasoline trucks is made possible by use of small, maneuverable pump-trucks and remote underground storage tanks, with pipelines extending underground to plane fueling points. Delivery of 200 gal. per min. is possible, with only 30 gal. of gas above ground at one time. —AVIATION NEWS



ELECTRONIC MICROMETER—Continuous measurement, at production-line speed, of wire diameter and strip thickness is accomplished by an electronic micrometer. The material passes across an aperture in a measuring head which is illuminated to cast a shadow of the object on the cathode of a phototube. The cathode area not in shadow produces a voltage signal. Openings on each side of the aperture are separately adjustable to represent positive and negative tolerance limits. A scanning disk exposes each of the apertures in sequence, feeding 3 voltage pedestals to the amplifier, each appearing as a horizontal line in the face of the oscilloscope screen. Change in material size causes the test trace to vary proportionately and to change its position on the screen relative to the position of the 2 fixed limit traces. —ELECTRONICS

New Way To Control Quality

Samples from production line are checked and deviations marked on chart. If variation is outside normal chance pattern, cause is found and corrected

Statistical quality control is a useful tool for the solution of many manufacturing problems. The many applications developed in war industries have demonstrated its diverse possibilities. There is no manufacturing business that cannot make some effective use of this technique. Variation in product quality is inevitable; wherever variation exists, statistical imagination and ingenuity may be expected to be helpful.

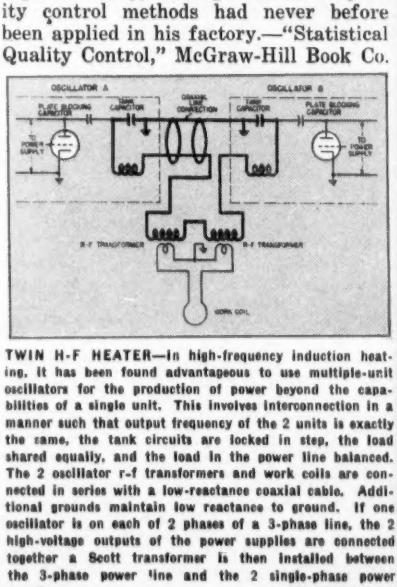
The essential tool in statistical quality control is the Shewhart control chart on which are drawn horizontal lines representing upper and lower tolerance limits and a "normal." In a manufacturing operation, samples of the product are checked for quality and plotted on the chart. If they fall outside of the tolerance lines, the cause is determined and corrected. The principle involved is this: Measured quality of manufactured product is always subject to a certain amount of variation as a result of chance. Some stable "system of chance causes" is inherent in any particular scheme of production and inspection. Variation within this stable pattern is inevitable. The reasons for variation outside this stable pattern may be discovered and corrected.

The power of the technique lies in its ability to separate out these assignable causes of quality variation. This makes possible the diagnosis and correction of many production troubles and often brings substantial improvements in product quality and reduction of spoilage and rework. Moreover, by identifying certain of the quality variations as inevitable chance variations, the control chart tells when to leave a process alone and thus prevents unnecessarily frequent adjustments that tend to increase variability.

Through its disclosure of the natural tolerances of a production process, the control-chart technique permits better decisions on engineering tolerances and better alternative production methods. Through improvement of conventional acceptance procedures, it often provides better quality assurance at lower inspection cost.

When natural tolerances are within specification tolerances, 100% inspection may be replaced by sampling inspection with the use of the control chart, saving time and expense, and in metalworking, reducing the wear on gages.

The technique is easy to apply. After hearing a 2-hr. lecture on the subject, a production foreman used the method experimentally, although statistical quality control methods had never before been applied in his factory.—"Statistical Quality Control," McGraw-Hill Book Co.



TWIN H-F HEATER—In high-frequency induction heating, it has been found advantageous to use multiple-unit oscillators for the production of power beyond the capabilities of a single unit. This involves interconnection in a manner such that output frequency of the 2 units is exactly the same, the tank circuits are locked in step, the load shared equally, and the load in the power line balanced. The 2 oscillator r-f transformers and work coils are connected in series with a low-reactance coaxial cable. Additional grounds maintain low reactance to ground. If one oscillator is on each of 2 phases of a 3-phase line, the 2 high-voltage outputs of the power supplies are connected together a Scott transformer is then installed between the 3-phase power line and the 2 single-phase power supplies. —ELECTRONICS

IN-PLANE TESTER SAVES MAINTENANCE TIME

Quick in-the-craft testing of electrical systems and instruments has greatly simplified trouble-shooting on the Pan American World Airway's Clippers. This has been made possible by a specially designed, inexpensive, portable instrument set. It consists of a 30-volt dc. voltmeter, 5,000- and 500-ohm potentiometers, a 14-pin Cannon plug, a series of Cannon receptacles (a 14-pin, two 4-pin, and a 2-pin), a toggle switch, 12-point rotary switch, Autosyn and switch.

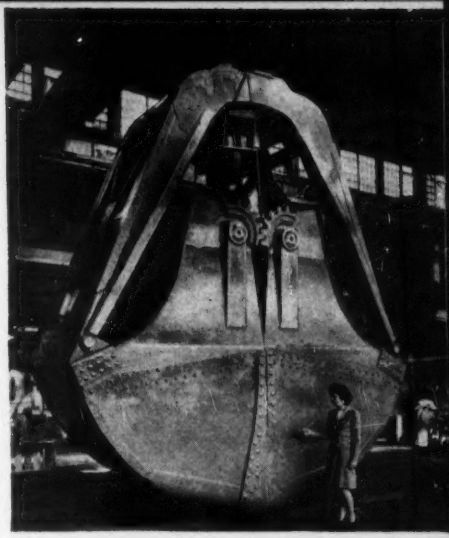
The tester operates as a flux gate test transmitter, and autosyn test transmitter, checks the ship's voltmeter, and provides for indicator operation of thermocouple, bridge thermometer, and ratiometer. Used in connection with the device is a pocket-size 0-30 ohmmeter and 0-30 ammeter unit with 2 test lights and a buzzer, used to check continuity of lines and in synchronization of magnetos. —AVIATION

PROFIT-SHARING PLAN WORKS

Plant efficiency has been lifted 60% by a plan for sharing cost savings at Bundy Tubing Co. The plan provides for equal sharing by company and employees of a fixed percentage of sales value of finished goods over the standard agreed upon by management and workers. In the first three months, the plan yielded $118.27 in extra earnings for those working the full period. Absenteeism among workers dropped 35.5%. —AMERICAN MACHINIST

SWEDEN'S NONFERROUS ORES

Although greatly expanded during the war, Sweden's metal resources appear by no means self-supporting in nonferrous metals. Consumption of nonferrous metals has dropped 40-60%. Probably Sweden will be forced to shut down unprofitable copper mines soon and production of nickel, lead, and zinc will cease, with imports becoming the source of nonferrous metals. —ENGRG. & MINING JOURNAL



BIG DIPPER—Blaw-Knox Co. produced this giant, 23-cu. yd. clamshell bucket for unloading coal on Lake Superior. Open clamshell measures 23½ ft. long, 19 ft. high, and weighs 27,500 lb. —BUSINESS WEEK

PREFERRED CHEMICALS FOR PROCESSING LEATHER

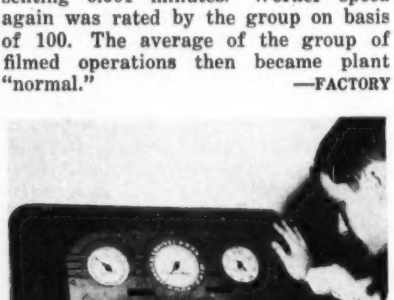
Due to the pressure of war, English tanneries used new chemicals, many of which, for quality and economic reasons, are now preferred to the materials they replaced. New depilatories and softening agents include sodium sulphydrate, sodium tetrasulphide, calcium sulphydrate, and calcium thyoglycolate. Of these, the first effects 40% economy in material, and gives greater control over alkalinity. For depilation, appreciable development work has been carried out on the use of lime liquor containing protein reduction products. Ammonium chloride, in deliming, apparently removes the protein degradation products present in the interstices of the fibers, as well as the free lime, and is relatively inexpensive.

In tanning, many new applications have been found for syntans containing sulphonic groups; for example, as levelling agents in coloring chrome tanned stock with acid and direct dyes. For neutralization of chrome leathers, diso-

dium phosphate and ammonium bicarbonate are being used. Sulphated fatty alcohols are finding wider use as wetting agents, and, in the drying of leather by pasting, methyl cellulose as an adhesive is easy to apply, does not stain and enables the leather to be quickly removed from the base. —CHEMICAL ENGRG.

FILM SETS WORK STANDARDS

To eliminate erratic judgement in determining "normal" working speed, Minneapolis-Honeywell trained as a group, foremen, union stewards, engineers, and setup men to rate (on a percentage of 100) worker speed on 10-15 different jobs. Results showed 75-80% of raters to be with ±5%. After rating became uniform, operations were filmed, at varying rates of operation, by 16-mm. cameras synchronized at 1,000 frames per minute, each frame representing 0.001 minutes. Worker speed again was rated by the group on basis of 100. The average of the group of filmed operations then became plant "normal." —FACTORY



QUIZ MACHINE—For a nickel you can check your intelligence with this $795 Telequiz Sales Co. slot machine with 4,000 questions in 8 categories. Question selected, with possible answers, is flashed on screen; player presses button numbers corresponding to his choice. For correct answers, machine pays up to 40 to 1. —BUSINESS WEEK

WORLD FEDERATION OF ENGINEERS

By unanimous decision of chief delegates from 30 countries to an International Technical Congress in Paris, an interim World Engineering Conference is to be composed of representatives from engineering societies of all nations, and directed by an executive board chosen from 12 countries. This is expected to grow into a World Engineering Federation, to mobilize and spread engineering knowledge and cooperation.

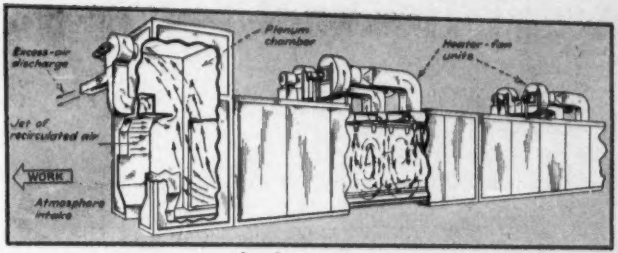
The interim Conference, ready to respond to calls for technical help, will sound out national engineering associations, has already emphasized the social responsibility of engineers to work for human progress, has recommended that the United Nations organize and call upon engineers of all fields for aid in reconstruction. President of the new Conference is A. Antoine, Inspector General of Electricité de France.—*Special report from McGraw-Hill World News Bureau.*

RADIO ON FREIGHT TRAINS

Each freight train running a long, curved 2.2% grade in Washington state is handled by 2 engines, the helper being midway in the train, and perhaps ½ mile from leading engine. To coordinate the two, a new type of vhf. railroad radio equipment operating on 152-162-mc. was installed in each cab.—ELECTRICAL WEST

BUTLER FOR BABY

Now making weekly home delivery of all items for the baby to residents of Washington and Pittsburgh, Baby's Butler Service hopes to expand into 25 other cities when additional truck transportation is available. K-9 Caterers, also in Washington, is providing the same service for dog owners. —BUSINESS WEEK



Direct - fired ovens for baking the finish on Dodge automobiles are divided into zones. A vestibule at either end prevents leakage of recirculated air.

DIRECT-FIRED OVENS BAKE PAINT ON AUTOS

Direct-fired gas ovens for baking synthetic body finishes have replaced indirect-fired ovens at Chrysler's Dodge division with these results:

1. A harder baked finish is secured without impairment.
2. Light colors are not affected.
3. Fuel savings are considerable.
4. Floorspace for ovens has been reduced 50%.
5. No long ducts are required, as the heaters are out of way on top of oven structures.
6. Power consumption has been reduced, because smaller volumes of air are handled.
7. Bodies emerge from ovens in cleaner condition.
8. Ovens are cleaner; drippings do not collect on floor. Cleaning is no longer an important maintenance task to avoid fires.

The long ovens are divided into zones, each with an individual heater-fan unit on top, a vestibule at either end preventing leakage of the recirculated air and ingress of atmosphere.

The heater-fan units employ a novel method for heating the recirculated air. An exhaust fan sucks air from a return duct of an oven zone and feeds it into what would normally be the outlet of a fan housing. As the recirculated air enters the scroll of the heater unit, it passes over a large mushrooming flame produced by an automatic gas burner firing into one side. The products of combustion, mixed with the recirculated air, leave the opposite side of the heater and enter the supply ducts. The ducts discharge heated, recirculated air at 2,000 fpm. from tapered sheet-metal nozzles pointing toward the floor. Air movement in the oven may be 6 to 25 times as great as in a indirect-fired oven. No temperature differentials exist.

Temperature is controlled by pneumatic throttling-type potentiometer controllers. —AMERICAN MACHINIST

FROZEN FOODS IN CANS

Foods will be packed in tin cans and then frozen by Pacific Grape Products Co. Vacuum sealed, the 1-lb. cans will provide protection against flavor change, oxidation, or blackening of food. Freezing process is automatic and continuous, the seamed cans entering a "reversed" continuous cooker which freezes contents in alcohol bath at -32° F. Process is completed in 40-45 min., producing 75 tons in 24 hours. Cost estimates are 2¢ above conventional packaging.—BUSINESS WEEK

AUTOPILOT LANDS PLANES

Instrument landing of United Air Lines transports will be facilitated by the new Sperry A 12 electronic gyropilot. Used in connection with the instrument-landing system installed at airports, the gyropilot is operated by radio signals. When the receiver picks up the localizer beacon, the instrument aligns the plane with the beam. When the glide path beacon is reached, the gyropilot also follows it, regardless of cross winds.

While DC-4's have been landed by the autopilot, it likely will be used to bring the ship down to 100 ft., at which time the pilot will take over and put the plane down. —AVIATION

AUTOMATIC PAINT SPRAYING OF CONTOURED PARTS

Automatic spray painting of fenders, hoods, stone shields, and fender center panel stamping above the radiator grille is now done by Dodge. All 12 contour spraying machines operate on the same principle: Overhead chain conveyor carries parts into a tunnel-like spray booth. Each of 4 stations in machine is equipped to follow work contour. Racks moving at rate of 8 ft. per 52 sec. are stopped by a magnetic braking system. After indexing, the rack is spun a definite number of revolutions per min. by means of a friction drive rack supported just below conveyor. The spray arm makes one motion, up or down, the gun always at the same angle and distance from the work.

Paint can be applied faster and more evenly than by hand, color change may be made in 3 min., using the same gun for 13 colors. —AMERICAN MACHINIST

HYDROCARBON SEPARATION PROCESS DEVELOPED

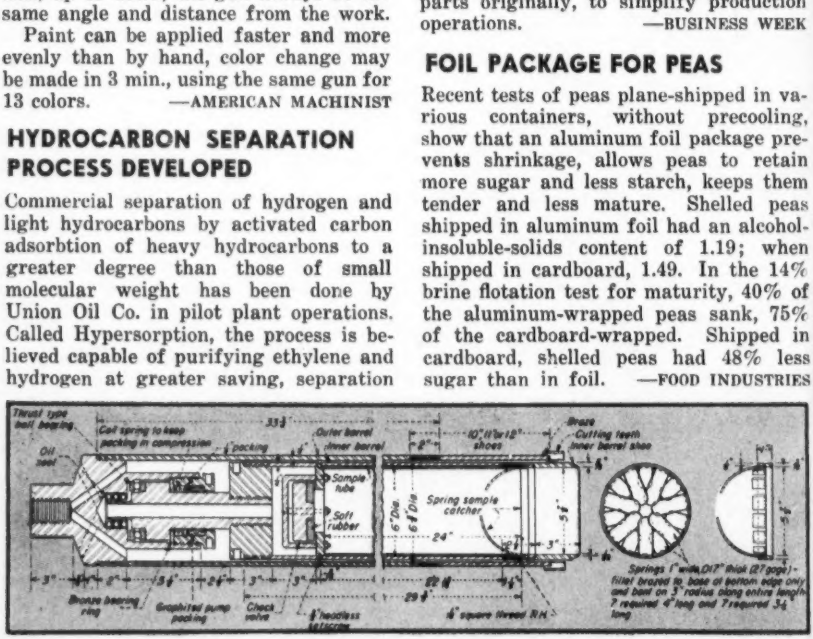
Commercial separation of hydrogen and light hydrocarbons by activated carbon adsorbtion of heavy hydrocarbons to a greater degree than those of small molecular weight has been done by Union Oil Co. in pilot plant operations. Called Hypersorption, the process is believed capable of purifying ethylene and hydrogen at greater saving, separation of methane from hydrogen in hydrogenation and hydroforming plants, separation in a single unit of ethane and ethylene from methane, hydrogen, and heavier constituents of gas streams in ethylene plants. The process is carried out in a column with the gas rising countercurrent to a downward-moving bed of granular charcoal. —CHEMICAL ENGRG.

STEEL-FRAME MOTORS

Westinghouse Electric Corp. has designed a new steel frame "Life Line" motor, reducing by 35% the size of the standard cast-iron motor. With improved performance and appearance, the motor is assembled from 126 parts for each horse power rating as compared with 2,800 parts originally, to simplify production operations. —BUSINESS WEEK

FOIL PACKAGE FOR PEAS

Recent tests of peas plane-shipped in various containers, without precooling, show that an aluminum foil package prevents shrinkage, allows peas to retain more sugar and less starch, keeps them tender and less mature. Shelled peas shipped in aluminum foil had an alcohol-insoluble-solids content of 1.19; when shipped in cardboard, 1.49. In the 14% brine flotation test for maturity, 40% of the aluminum-wrapped peas sank, 75% of the cardboard-wrapped. Shipped in cardboard, shelled peas had 48% less sugar than in foil. —FOOD INDUSTRIES


Thrust type ball bearing
Coil spring to keep packing in compression
Oil seal
Packing
Outer barrel
Inner barrel
Sample tube
Soft rubber
Spring sample catcher
Braze
Cutting teeth
Inner barrel shoe
Bronze bearing ring
Graphited pump packing
Check valve
4" headless 8 NS/IN
4" square thread R.H.
Springs 1" wide, 0.17" thick (27 gage) - fillet brazed to base at bottom edge only and bent on 3" radius along entire length. 7 required 4" long and 7 required 3¼" long

IMPROVED SOIL SAMPLER — To obtain undisturbed samples of all types of overburden except gravel, this instrument has an inner barrel free to turn independently of outer barrel, and the length of the outer cutting shoe and design of teeth are varied to meet field conditions. Inner bit and steel spring catcher serve to cut and retain sample of soil. Bit is driven by hydraulic-feed standard diamond drill machine. —ENGRG. NEWS-RECORD

Frame Walls Evaluated

Diagonal sheathing found superior to horizontal in both rigidity and strength; siding increases factors

Tests conducted by Forest Product Laboratory showed 1x8 lumber applied diagonally in tension without window or door openings to be 4 times as rigid and 8 times as strong as horizontally applied reference walls. Reference walls, 9-14 ft., of southern yellow pine, with 2x4 upper and lower plates and 2x4 studs spaced 16 in. on center, were used. Fiberboard sheathing 29/32-in. thick, 19.4 lb. per cu. ft. proved 3 times as stiff and almost 4 times as strong; however, fiberboard cut for openings failed at re-entrant angles. Plywood 1/4-in. sheathing added strength and rigidity to structure, and when glued to frame rigidity and strength factors of 14.4 and 8.6 were determined. Added rigidity and strength probably do not warrant the increased work in gluing plywood to each stud.

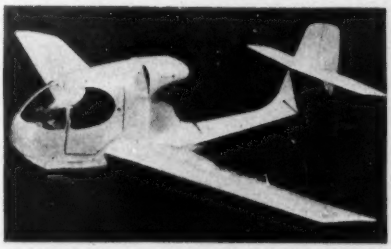
Herringbone, cut-in, and let-in bracing between studs of horizontal sheathing for greater strength and rigidity proved: Herringbone bracing, slight; cut-in, 1.6 strength and 1.4 rigidity; let-in, 2.6 and 3.4. Let-in braces were 1x4 board let into studs at 45- to 60-deg. angles; cut-ins were 2x4 placed at similar angles. Black-iron straps with tensile strength of 1,400 lb., nailed with galvanized, large-head roofing nails, proved to have less strength and rigidity than diagonal sheathing or horizontal sheathing with let-in bracing, even with 7 straps per panel.

Siding improved strength and rigidity when added to horizontal or diagonal sheathing with openings; bevel siding alone gave no added rigidity or strength, but with let-in bracing both properties increased. Wood lathing and plaster without openings proved more rigid than any lumber sheathing, even with braces. With openings in walls, lath and plaster walls appear more than twice as rigid and slightly less than twice as strong as horizontal sheathing. The plaster on wood lath may furnish all the strength and rigidity necessary for most construction under normal conditions.

In horizontal sheathing, an increase from 2 to 4 nails per crossing increased rigidity 40% through increased friction with studding. Increased rigidity in diagonal sheathing by adding nails at crossings was determined but does not appear necessary. Replacing standard 8d nails with 10-12d in horizontal sheathing increased rigidity 50%, in diagonal sheathing 20%. —ENGRG. NEWS-RECORD

1-A-MINUTE RR CAR WASHER

Railway passenger cars are washed at a rate of 1 a min. by Boston & Maine Railroad. The cars are moved at about 1 mph. between heavy revolving brushes mounted on vertical shafts and driven by electric motors, the brush units being swung out by 40 psi. compressed air to contact the car sides. Water at 50-60 psi. sprays over the cars, or cleaning compounds are used. Clear-water rinsing follows the wash. —ELECTRICAL WORLD



DUCKLING—Now undergoing radio-controlled scale-model testing, International Aviation Corp.'s new 2-place personal amphibian is of special low-wing design to eliminate wing-tip floats or sponsons. The wing roots serve as sponsons and broad fuselage gives added on-water stability. To span 34 ft. 8 in., the Duckling will weigh 1,500 lb. gross, will cruise at 125 mph. —AVIATION

NEW PRODUCTS

Self-peeling Sausages—Retaining the color and flavor of sausage meats, a Pliofilm casing developed by the Goodyear Tire & Rubber Co. is tensilized to get a circumferential rather than a longitudinal stretch. Dipped in hot water, the casing shrinks. It unpeels as sausage is sliced. —FOOD INDUSTRIES

Residential Circuit Breaker—For small housing units the new Square D Co. MO-4 multibreaker replaces conventional fuses, is both magnetic and thermal in action. Handling 4 circuits, a major overload will cause magnetic tripping while sustained low overload trips the thermal element. —BUSINESS WEEK

Puts Out Big Fires—Trailer-type extinguisher introduced by Cardox Corp. carries 750 lb. of low-pressure carbon dioxide and 32 gal. of mechanical foam solution. Two long-range nozzles on 100 ft. of hose discharge 400 lb. of CO_2 a min. A foam gun, also on a 100 ft. hose, has an 18-gal.-per-min. rate. Unit has extinguished 200 gal. of gasoline burning over a wide area. —ELECTRICAL WORLD

Will Grind Anything—DoAll Co. has developed a grinding wheel that is said to work equally well for fast roughing cuts and fine finishing and to grind hardened alloy tool steel, annealed, stainless, Monel, bronze, aluminum, brass, and hard plastics. Production 3 to 10 times conventional rate is claimed because of special cutting crystals and bonding. —AMERICAN MACHINIST

Pre-built Home Cores—Space- and money-saving, a 9½-ft.-square unit of household appliances incorporates refrigerator, clothes washer, counter, sink, range, and storage cabinets, and can be hooked up in 20 min. This Ingersoll Utility Core costs about $1,300. Similar cores are pre-built for furnace and bathroom. —SCIENCE ILLUSTRATED

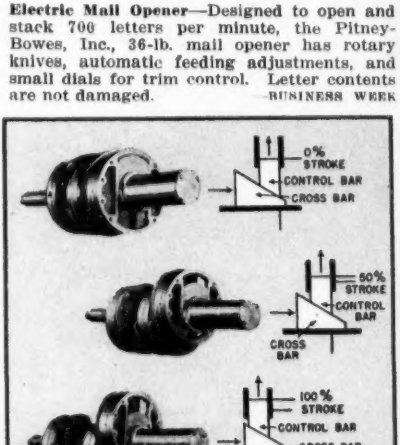
Vest-pocket Vibrometer—A steel reed feeds out from the Vibrometer case and snaps into sharp vibration when it comes into tune with the machine against which the instrument is held. Frequency is then read on the reed-feed-out dial. For noise, the reed is plucked and tuned to the sound being measured. Smaller than the hand, this instrument was developed by Vibroscope Co. —POWER

Erasable Dictation—Thin disks from which errors can be erased are used on Ellinwood Industries' new dictating machine. The disks are inexpensive and may be discarded instead of regrooved. —ELECTRONICS

Voice-on-a-wire "Salesman"—For use with advertising billboards, in museums, or at amusement centers to repeat information, the new Sound Salesman wire recorder of Sound Media is enclosed in a 12x12x14-in. black plastic cabinet. —ELECTRONICS

Holds the Phone—Developed for Army message installations and manufactured by Rayem Plastics Products Corp., a telephone attachment which rests the phone on the user's shoulder, thus freeing both hands, is being installed in ticket offices and airport terminals. —AIR TRANSPORT

Electric Mail Opener—Designed to open and stack 700 letters per minute, the Pitney-Bowes, Inc., 36-lb. mail opener has rotary knives, automatic feeding adjustments, and small dials for trim control. Letter contents are not damaged. —BUSINESS WEEK



ECCENTRIC ENGINEERING—Stepless variation in capacity between 0 and 100% has been achieved in the Worthington Variflow pump. This is done by shifting the position of an eccentric to vary the length of the plunger stroke. A hydraulically moved control bar sliding in the hollow crankshaft moves a cross bar which positions the eccentric. Oblique tooth racks, operating as a series of inclined planes, form the engagement between the control bar and crossbar. As the control bar slides inwardly, the crossbar and eccentric are forced radially outward to increase eccentricity and, in effect, lengthen the eccentric rod to drive the crosshead through a greater stroke. —PRODUCT ENGRG.

Aluminum Awnings—Of aircraft-type riveted construction, aluminum awnings produced by Kool-Vent Metal Corp. of America have alternating separate layers or strips overlapping adjacent strips, permitting air circulation and admission of light. Finish is in natural aluminum or baked enamel. —FACTORY

Handy Lighting Unit—Thompson Electric Co. has developed a lighting fixture which can be lowered for maintenance. A long rod is inserted in center of fixture, unlocking the 2 sections and permitting lighting mechanism to be lowered 6 ft. Coil springs compensate for fixture weight. —ELECTRICAL WORLD

Powerful Spot Welder—Sciaky Bros., Inc., has developed a giant spot welder able to weld 3 thicknesses of ½-in. structural steel through scale or rust. Speed is 2–25 spots per min., with peak power for maximum thickness about 500 kva. —WELDING ENGR.

Pump Improves Plating—Plating time is said to be reduced and quality improved by pump circulation of the solution in the Mercil unit announced by Hanson-Van Winkle-Munning. When working with cyanide solution, the cyanide consumption is less and the carbonates in the bottom of the tank are reduced in volume. —AMERICAN MACHINIST

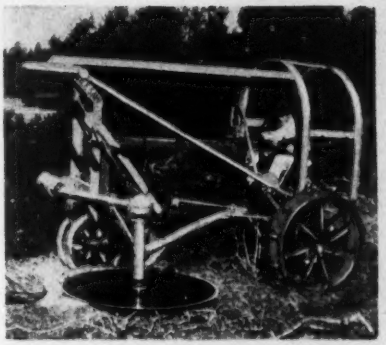
Magnesium B'asting Powder—Based on magnesium dust and used experimentally in limestone quarries, new Permanete Metals Corp. powder gives greater safety than current powders. It is insensitive to shock; sparks will not ignite it; match will cause ignition, not detonation. —CHEMICAL ENGRG.

Wide Magnifier—Elroy Products Co. is manufacturing a 4-in. folding magnifier with 3½-in. lens. The 2½-power glass permits magnification of a wide area. —MILL SUPPLIES

Doughnut Gun—Large enough to hold batter for 24 doughnuts, an 8-piece aluminum and stainless steel device offered by Homade, Inc., forms doughnuts when a trigger is pressed. The mix, which requires only the addition of water. —FOOD INDUSTRIES

Better Vitamin A Reagent—Activated GDH, a colorimetric reagent prepared from glycerol dichlorhydrin by J. B. Shohan Labs. develops a color with vitamin A which is stable for about 8 minutes, in contrast to 4 sec. for antimony trichloride. It is unaffected by traces of moisture, leaves no film, is stable, non-corrosive, and non-poisonous, as well as being accurate. —CHEMICAL ENGRG.

Gas Leak Detector—For leak testing in high vacuum, electronic tube, distillation, and metal-evaporating fields, Vacuum-Electronic Engineering Co. is manufacturing a portable mass spectrometer, indicating 1 part in 100,000 of helium in air. —BUSINESS WEEK



BRUSH CUTTER—This 48- or 60-in.-dia. saw, driven by power takeoff on farm-type tractor, will cut brush and trees up to 4-in. dia. Ball bearing universal joint in the driving assembly allows saw to be raised for crosscut work. —CONSTRUCTION METHODS

Obsoletes Golf Bag—To eliminate the golf bag, Tunghoff Mfg. Co. produces a 2-wheeled, rubber-tired, tubular-steel cart capable of carrying a complete set of clubs. Clubs are held in place by adjustable, flat wire spring clips. Cart fits golf locker.—BUSINESS WEEK

For Mountain Driving—Compensating for temperature and pressure changes, Bendix Stromberg carburetor will eliminate carburetor adjustments in mountain driving. It has a small bellows partially filled with oil and nitrogen gas; temperature or pressure changes contract or expand oil and gas to control fuel mixture. —BUS TRANSPORTATION

Petroleum Solvents—New noncorrosive, chemically inert solvents, sulpholanes, to remove sulphur and to separate petroleum components, are produced by Shell Chemical Corp. They may be removed by water wash. Study is being made for applications in refining vegetable oil. —CHEMICAL ENGRG.

For Road Soundings—Practical and economical, a portable seismograph being made by Diamond Instrument Co. locates rock levels on highways. —ENGRG. NEWS-RECORD

X-Ray Thickness Gage—Sheffield Corp.'s Measuray checks thickness of materials without contact, using X-ray and electronic principles. A comparator, it measures variations in thickness to within 1%.—BUSINESS WEEK

Walk-through Conveyor—For bridging aisleways, a gravity roller conveyor introduced by Rapids-Standard Co. has a 36-in. hinged section which swings upward and back to open a passageway. —AMERICAN MACHINIST

NEW PRODUCTS

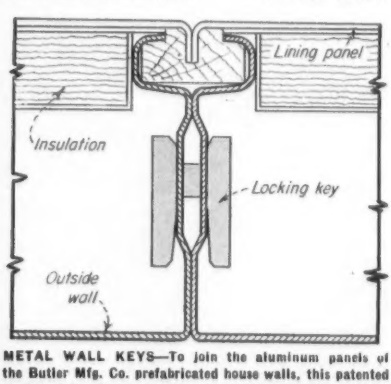
Barbers Sit at Work—A swinging seat on an L-shaped support pivoted on a vertical hanger under a barber's chair permits barber to cut hair while seated. It is a Stephen C. Butz & Co. innovation. —BUSINESS WEEK

Quick Tool-angle Checker—Rake and clearance angles on cutting tools are measured by the new Opti-Checker instrument of Benton Co. The tool is held in contact with a straight edge on the instrument base and precision guide lines are aligned, in a magnifying optical viewer, with the cutting edge. Readings are given directly on a protractor scale. —AMERICAN MACHINIST

Aluminum Wheels—Lighter by 30-50% than wheels of equal ratings, the new Aeral Co. wheel of double wall, flush design, is available in 4-20-in. sizes. Roller bearings are prelubricated, eliminating axle wear and side play. Special interlocking retainers keep grease in and dirt out. —MILL SUPPLIES

Handy Drawing Pad—Without the use of ruler, drafting board, or T-square, properly proportioned drawings can be made on sheets of tracing paper in a cardboard-covered pad produced by Jiffy Sales Co. Various scales are printed on 3 flaps and these fold under the tracing tissue. —ENGRG. NEWS-RECORD

Electric Artificial Arm—To aid veterans who lost a limb in the war, International Business Machines Corp. devised an electrically operated artificial arm. —PRODUCT ENGRG.



METAL WALL KEYS—To join the aluminum panels of the Butler Mfg. Co. prefabricated house walls, this patented H-shaped key is inserted through accurately notched slots, turned 90 deg. and driven against one end of the slot. The prefabricated houses measure 24x33 ft., include 2 bedrooms, central utility room, kitchen and corner dining area. —ENGRG. NEWS-RECORD

Self-slicing Package—Incorporated in the package, a string is used first as a "rip-cord" to open the end, then to slice the bread or other loaf product in the package. This patented device of Bruce Slonneger Products Co. does not mutilate the wrapper, has been used for ice cream, fruit cake, meat loaf, butter, yeast, cheese, soap. —FOOD INDUSTRIES

Electronic Soap Control—Designed for automatic dishwashers, a Barnes & Reinecke electronically controlled dispenser regulates detergent concentration in the wash solution. Operated by a change in solution conductivity, the unit consists of an ac. resistance bridge and amplifier. —ELECTRONICS

Self-propelled Arc Welder—Designed by Hobart Bros. Co. to simplify welding operations in the yards of large railway companies, a new self-propelled arc welder is equally useful around oil refineries and factories. The automotive unit is powered by a 6-cyl engine that also drives a 300-amp. generator. Carriers are provided for oxygen and acetylene cylinders. —WELDING ENGR.

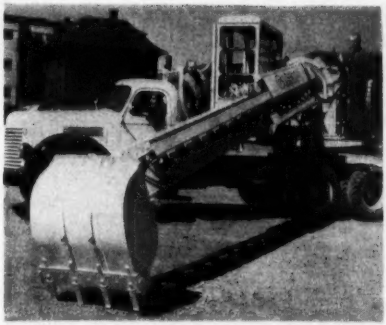
High-capacity Contactor — Electric motor loads up to 2 hp. are handled by a new contactor having a plunger that is pulled into a pool of mercury by a solenoid. Mack Electric Devices Co. makes it. —ELECTRONICS

Handy Spiral Tubing—One man can carry 60 ft. of a new spiral tubing formed from metal strip with edges joined in continuous 4-ply lock-seam. With 0.03-in. walls, pipe will not distort under 1-ton force. Made by Pratt Industries, Inc., the tubing has applications in mining, irrigation systems, concrete forms. —ENGRG. NEWS-RECORD

Checks Lead of Helical Gears—The lead of helical gears is checked precisely by a new dial instrument of Fellows Gear Shaper Co. The pointer shows to 0.0001 in. the displacement of the helix in the face width being measured. The principle comprises 2 tangent bars and pins, both of which operate slides. One slide effects traverse movement of member carrying the pointer, the other, the rotation of the work. An electrical recorder charts tooth-face displacement. The instrument will check taper and crowning of gear teeth. —AMERICAN MACHINIST

Angular Straight Edge—For machine builders and rebuilders, Machine Products Corp. is producing a heat-treated Meehanite straight edge from 18 to 84 in. long with angle as desired, useful for scraping and checking machine ways and slides. —MILL SUPPLIES

Electric Multiplier—Machines with no moving parts, capable of multiplying 6 digits at the rate of 100 per min., are produced by International Business Machines Corp. Products are read by the machine and reproduced as holes in the card. —BUSINESS WEEK



FLEXIBLE EARTH MOVER—Of all-welded construction, with hydraulic controls, this multipurpose earth mover has its 24-ft. telescoping boom and control cab mounted on a 360-deg. turntable. Double-ring assembly permits boom to tilt 45 deg. in either direction from horizontal. Produced by Warner & Swasey Co., it is powered by gas engine operating at 1,200 rpm. Unit drives 4 gear pumps to operate at 1,000 psi. —ENGRG. NEWS-RECORD

Whistle Opens Door—Picked up by a microphone above the garage door, supersonic waves produced by a whistle operated from the automobile instrument panel actuate a door-lifting and closing motor. It is a development of Vendo Co. —BUSINESS WEEK

Handy Boring Lathe—For finish-boring cylinders up to 28-in. dia., a new 48-in. lathe has a 34-ft., 1-piece bed and is so designed that the 2,400-lb. boring bar does not have to be removed and remounted when unloading work. The boring lathe is made by American Tool Co. —AMERICAN MACHINIST

Better Than Detector Tubes—Requiring little space, needing no filament supply, and having a lower thermal noise than tubes, the thumb-nail size type 1H21B silicon crystals of Sylvania Electric Products, Inc., can be used as first detectors in superheterodyne receivers operating in the region of 3,000 megacycles. —ELECTRONICS

Water-injection Carburetor—Injecting water or water-alcohol into fuel mixture through airhorn, the Vanderpool Water carburetor acts as coolant, suppresses detonation and preignition, gives higher power output, and increases combustion period. Carbonaceous gum around rings is dissolved; greater horsepower results. —BUS TRANSPORTATION

Large Arcs Drawn Easily—A flexible steel beam is adjusted to form an arc of any radius from 34.2 in. to infinity by moving an indicator knob along the scale of a device developed by Arcmeter Co. A series of arcs can be drawn. —AMERICAN MACHINIST

Tells How Long Ago—An electrical indicator introduced by Marion Electrical Instrument Co. indicates elapsed time from 0 to 9,999 hours. It operates on 115 volts, 60 cycles, is hermetically sealed. —PRODUCT ENGRG.

Lifetime Silicone Paint—Developed by General Electric Corp., a new silicone paint for automobiles, refrigerators, and stoves will retain original color and gloss, resisting weather or chemicals. —CHEMICAL ENGRG.

Better Wheel Contact—Operated by dashboard switch, the Elston electric sander is mounted ahead of wheels to give bus added grip on icy roads. —BUS TRANSPORTATION

Electronic Dispenser—Comprising the complete mechanical and electrical means of feeding, counting, and dispensing small units, a device announced by Raymond M. Wilmotte, Inc., employs a selective electronic counter. Handling sizes from $\frac{3}{16}$ to $\frac{3}{4}$ in., it achieves speeds to 100 per sec. —FOOD INDUSTRIES

Silicone-plastic Capacitors — Insulation ranges up to 20,000 megohms per microfarad have been obtained with the silicone impregnation and plastic film dielectric in Condenser Products Co.'s new capacitors. Voltages range from 600 to over 30,000 volts.—ELECTRONICS

Spring Conveyor — Multiple endless steel springs form the conveying surface on a motor-driven flexible conveyor developed by E. C. Horn Machinery Co. This conveyor carries packages of not over 200 lb. around 90-deg. angles. —CHEMICAL ENGRG.

Bubbling Xmas Light—Norma Electric Corp. has developed a "Bubble-Lite" Christmas tree decoration consisting of a candle-shaped, 3-in. tube set in translucent base with 4.5-watt bulb. Bulb provides heat to whirl colored fluid in tube. —ELECTRICAL MERCHANDISING

Handy Druggist's Scale—To eliminate mathematical calculations in the preparations of solutions in which water weight must be figured, Louis W. Yagle developed a new scale for pharmacists. Each unit, termed "yagle," is equal to 1% of the weight of a fluid dram of water. —BUSINESS WEEK

FREE SERVICE TO READERS

As a special service to our readers, The McGraw-Hill Digest will furnish, without charge, additional information about any new product or technical development described in the publication. Inquiries are welcomed. Address your letter to: The Editor, The McGraw-Hill Digest, 330 West 42nd St., New York 18, N. Y., U. S. A. —*THE EDITORS*

Modern Lighting Methods

Lighting shows trend toward lower brightness ratios, better control, consideration for surrounding factors

In today's market, illumination techniques are of first-rank importance. Sources, components, and fixtures evolve in ever-increasing variety. Well-designed and well-engineered equipment, coupled with a study of installation methods and the adaptations necessary for the particular lighting task, are bringing great progress in all fields.

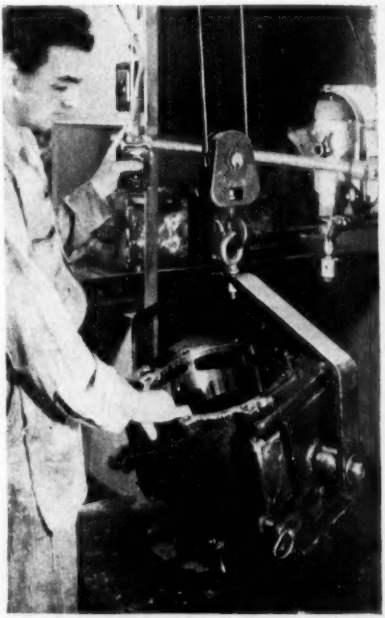
Selling—High-intensity white lighting, with adjustable spot and flood-type reflector lamps, is good window-lighting practice. Borders, drama, horizon, and footlights, with colors, accent the displays. Dimmer-controlled circuits and louvered tormentor lights are effective against backgrounds of varying colors.

For store interiors, fluorescent and incandescent lamps are concealed behind a ceiling of all-metal egg-crate louver design; or recessed fluorescent troffers with glass panels combine with recessed louvered incandescent reflectors of mirrored glass to brighten a large main floor.

Industry—Where work involves medium, fine, and extra fine detail, supplementary lighting increases illumination in those areas from 75 to 250 footcandles. Production, safety, and morale were thereby improved, spoilage and eyestrain decreased, cleanliness and neatness encouraged. Low-bay areas have continuous rows, or grid patterns, of 2-lamp fluorescent units, giving a 50-footcandle intensity. High-bay areas use incandescent and mercury-vapor reflector units, the latter being particularly suitable for metalworking. Large assembly areas are given well-diffused illumination by fluorescent reflectors using two 100-watt lamps each. Indirect lighting from an inverted reflector in a large hood provides glare-free lighting over an inspection bench.

Staggering of mercury and incandescent units has advantage of mixing color of 2 light sources for better seeing conditions and maintains light at safe level in case of power interruptions.

Safety—Sodium vapor lighting is very practical for grade crossings and underpasses. Narrow streets are effectively illuminated with 2-way luminaires installed 25 ft. above center of street and 300 ft. apart. Four-way luminaires are



FOR MASS PRODUCTION—This yoke holds heavy casting in any position during dipping and cleaning operations; it rotates through 360-deg. Spring stops snap into place automatically, are released by hand. SKF Industries, Inc., has adopted other similar hook and tong hoists for loading and unloading heavy castings at turret-lathes, hydraulic testing machines, multiple-spindle drills, and similar operations, to facilitate mass production. —FACTORY

used at intersections. Busy highways and parkways are being made safer by 15,000-lumen series incandescent lamps in high luminaires which are staggered on 100-ft. spacing.

Study—An Ohio classroom is lighted to an average intensity of 67 footcandles by 3 rows of continuous 2-lamp 40-watt fluorescent equipment, each 28 ft. long, spaced 8 ft. apart. White acoustical ceiling has 75% reflection factor, light green wall and tackboard area has 65%. Darker green is used for blackboard trim, chalk trays, doors. A school in Westchester uses semi-indirect fluorescent units, and chalk-boards are mat-white; blue chalk is used. —ELECTRICAL CONTRACTING

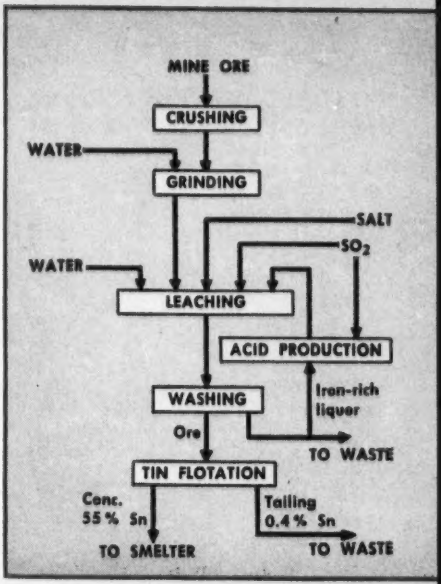
BOUNDARY LAYER CONTROL TO RAISE PLANE EFFICIENCY

New applications of aircraft boundary-air-layer control which may net gains of 50% in cruising speed, 32% in fuel economy, and 22% in useful load for transports have been developed by Douglas-Aircraft engineers. The principles have been incorporated into the design for an 85-ton airplane which is to cruise at 500 mph., take off in 80% of customary distance.

Because the thin layer of air (0.03 to 0.06 in.) next to the aircraft surface moves at a speed slower (up to 94%) than that of free air, it accounts for half the total drag. By speeding its movement across the aircraft surfaces and sucking it away, total drag may be halved.

The Douglas engineers propose to suck half the boundary layer through a series of slots in the trailing edges of wings, vertical and horizontal stabilizers, and the forward section of the fuselage. They also plan to supply the turbojets with low-velocity air taken in through the slots, thereby solving a problem of current jet installations.

While the design is based on preliminary data, the advantages promised by boundry layer control are great enough to warrant continued research and development. —AVIATION NEWS



TIN FLOTATION WILL WORK—On Canutillos ore assaying about 15% Fe and 2.8% Sn as cassiterite finely disseminated in a gangue of goethite and quartz, the optimum results than can be expected from different concentrating methods are: (1) Gravity concentration, 24% grade and 26% recovery. (2) Straight flotation, 19% grade and 60% recovery. (3) Leaching, followed by flotation (above) 55% grade and 85% recovery. The last, while relatively elaborate, gives results so much the best that it is economically sound. —ENRGR. & MINING JOURNAL

JET PROPULSION FOR BOATS

"Hydropulsion" powerplants for boats, using water instead of gas propellents, have been demonstrated by Grey Marine Motors Co. With good performance in marshy waters, the compact engine is linked to the hydraulic unit which forces the water, under pressure, through a nozzle for propulsion. —BUSINESS WEEK

VACU-BLASTER

Equipped with a nozzle light enough for hand operation and provided with push-button control, an abrasive blasting machine produced by Vacu-Blaster Co. picks up the spent abrasive and dislodged particles by vacuum and separates them so that the abrasive can be used over and over. No dust escapes around the nozzle. —WELDING ENGRG.

CONTINUOUSLY VARIABLE MOTOR CONTROL BY RADIO

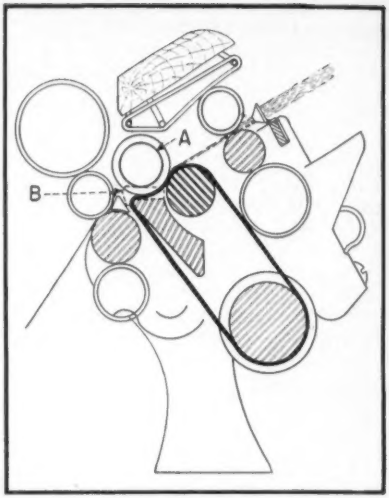
Continuously variable remote control by radio of the position of a servo-motor operated device is achieved with a resonant circuit to control the current flowing through the servo motor winding.

The servo is a conventional 2-phase motor sensitive to small phase-angle shifts. The resonant circuit, consisting of capacitance and inductance, is in series with phase 1 of the motor and controls the phase of the current flowing through that winding. Phase 2 is directly across the line, and the current through it is approximately in phase regardless of line frequency.

The torque output of a 2-phase motor is proportional to the product of the currents in phases 1 and 2 and the sine of the phase angle between the 2 currents. The current through phase 1 is varied by changing line frequency, causing the servo motor to develop torque in either direction.

Transmission of the line frequency by radio provides the means for remotely controlling the servo motor. Thyratrons can be employed as phase-sensitive servos instead of a 2-phase motor to permit the control of large motors from the output of a small amplifier.

By coupling the servo motor mechanically to a variable inductance in the resonant circuit, the controlled shaft may be definitely positioned. —ELECTRONICS



LONG-DRAFT SPINNING—Proved successful in commercial operation, the Shaw principle of long-draft spinning involves control of the long fibers between the middle and front rolls. The system also restrains the shorter fibers, which are passed along in proper sequence to the nip of the front roll, allowing longer drafts. This control is obtained by using a large middle top roll which is set ahead of the bottom middle roll and drives the apron on the middle roll. This apron runs over the bottom middle roll and over a guide bar between front and middle roll. Pressure between middle roll and apron is controlled by bushing A at end of roll resting on cap-bar B. Fibers are gripped most tightly where the apron first contacts the top roll. Drafts up to 50 have been attained. —TEXTILE WORLD

SWISS CHEMICAL FUTURE

Switzerland's chemical industry, technically, scientifically, and financially sound after 6 years of war, has embarked on an expansion program to increase production and export. Hampered by inability to import raw materials, Switzerland has negotiated trade treaties, affecting chemical fields, with France, Soviet Union, Czechoslovakia, and other countries. On speed of currency stabilization, prices, reconversion in other countries, and political settlements, hinges her future. Dye production, half of Swiss prewar chemical export, is rapidly reaching its prewar trade position; pharmaceutical production, with accent on synthetic drugs, is growing in importance; output of DDT is greatly increased. —CHEMICAL ENGRG.

STAR-STEERED BOMBS?

Self-navigating aerial weapons which speed 5,000 mph. and are guided by the stars are a possibility, in the opinion of L. D. Bell, president of Bell Aircraft Corp. Such missiles may have a 5,000- to 10,000-mile range. —AVIATION NEWS

German Ersatz Foods

Close government supervision of food industry in wartime resulted in new methods for producing rationed commodities

Synthetic Fats—Approximately 400,000 lb. of margarine per month was produced from synthetic fats made from coal. The coal was coked, the coke was used to prepare carbon monoxide, and hydrogenation (over cobalt or iron) of this gas produced hydrocarbons and waxes of varying chain length. The more volatile hydrocarbons were used for synthetic gasoline, the less volatile were oxidized (by 24-hr. air blowing in presence of potassium permanganate) into fatty acids which, after redistillation, esterification with glycerin, refining, and deodorizing, were processed in the conventional manner into good quality margarine.

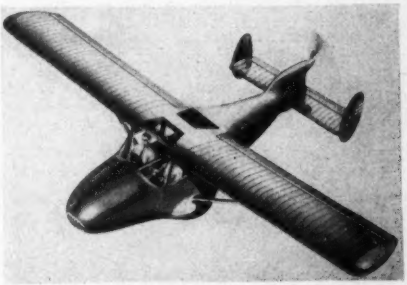
Proteins from Molds—Acidic sulphite waste liquors from the primary stages of textile and paper manufacture, containing 4-5% sugar, were neutralized with lime and ammonia, sterilized, and inoculated step-wise with *Oidium lactis* mold. The mold grew prodigiously, yielding a cream-colored product which, when filtered off, salted, spiced, and stuffed into casing, was sold as sausage.

Similar protein materials were made by inoculating the liquors with Torulae yeast, and also with *Aspergillus niger*. This latter method, giving a high yield of good product with objectionable color, could find wide use in preparation of livestock feed.

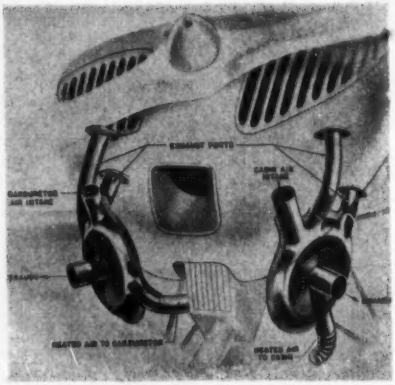
Coffee and Spices—Rye grains, or mixtures of rye and barley, were swollen by steam treatment and roasted to proper color for use in ersatz commodities. In the "coffee" mixture, chicory and sugar beet were added. For "pepper", 50% ground prune pits were used as carrier for the capsicum in combination with 50% roasted rye. Impregnated with cinnamic aldehyde, the processed rye and barley produced "cinnamon." In the "spice" mixture, the roasted grains, made as porous as possible, were treated with various essential oils or blends of these oils and synthetic materials to produce the desired flavor. —FOOD INDUSTRIES

SAFE CHEMICAL TRUCKS

To reduce hazards involved in transporting flammable chemicals over highways, Hercules Powder Co. has installed new safety mechanical features and extinguisher systems in its truck fleet. An automatic carbon dioxide extinguisher system floods the engine compartment, gas tank, and ground under engine from 20-lb. cylinder (850 psi.) outside cab. Mechanical protective features include: protectoseal to gas inlet of tank and to airhorn of carburetor, fine-mesh wire screen on exhaust to halt glowing carbon, metal sediment tank in addition to glass trap, and metal shield with asbestos paper between exhaust pipe and truck. —CHEMICAL ENGRG.



ADVANCED DESIGN—The pusher propeller on the tail is powered by a 215-hp. Franklin air-cooled engine in the nose of the "Aristocraft," first 2-control, nonspinnable personal plane in 4-place class, to be mass produced by Waco Aircraft Co. Tail propeller eliminates slipstream drag, is safer for personnel on ground, lessens cabin noise. Nose-wheel is steerable, landing gear retracts into wells which permit wheels-up landing, with use of brakes and without damage to plane or propeller. Cruising speed, 154 mph; stall speed, 55 mph; price $9,880. —AVIATION NEWS



LIGHTPLANE MUFFLER—Eliminating 90% of the engine noise, with less than 2% power loss, this 8-lb., stainless steel Ryan muffler is available for 65-85-hp. lightplanes. It includes a complete exhaust system and provides for carburetor and cabin heat. —AVIATION NEWS

INFRARED LAMPS HANDY IN THE HOME

Homes are an important potential market for the infrared lamp, which has more applications than the popular flashlight. This lamp will effectively blister and loosen paint for easy removal with a scraper, dry hair and nail polish, thaw frozen pipes and melt the grease in a clogged kitchen drain trap, sooth body aches, defrost refrigerators, dry dishes, deflea dogs, dry paint and photographic prints, heat poultry brooders, supply supplemental heat in a room, warm cold automobile engines, and will even cook foods. —ELECTRICAL WHOLESALING

SPEEDS COAL MINING

Coal output of nearly 9 tons per man-shift has been reached by Imperial Coal Co. in extracting barrier pillars with flat-face 6x2½-ft. pans and 13 conveyors. A pan is shoved to rear of undercut and center is shot down on it, the conveyor shaking out coal. Then ribs are shot over, face pans carrying large part of coal. —COAL AGE

DYNAMOMETER BUS TESTS CUT COSTS, SAVE TIME

Performing all vehicle power tests on a dynamometer, simulating actual road conditions, has cut road breakdowns 25%, saved time by eliminating guesswork on inspections, and improved gas mileage for Erie Coach Co. Faulty governors, ignition, timing, water pumps, and clogged radiators will be detected in a 25-min. test. —BUS TRANSPORTATION

CLOSE INVENTORY CONTROL

Problems of inventory control of 7,500 different items have been solved by General Aniline & Film Corp. through a system of 3-point inventory and master file of manufacturing orders. Translucent master sheets from which all manufacturing orders and related forms can be duplicated adds speed and accuracy. Cards list 3 control points: minimum point, amount of material economically practical to carry; order point, set by adding anticipated use to minimum point; maximum point, average daily consumption times calendar days added to order point. —FACTORY

MORE POWER FOR SWISS

Switzerland is mapping large-scale exploitation of untapped hydroelectric resources. The largest project calls for a 675-ft.-high dam across the Ruess below Andermatt. To take 19 yr., and cost $275,000,000, this project will produce 2.8 billion kwhr. annually, adding 35% to Swiss hydro capacity. Developments on the Upper Rhine and Linth rivers would produce 1.1 and 0.9 billion kwhr., respectively. —POWER

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